APPENDIX TO THE REPORT OF THE MINISTER OF AGRICULTURE

EXPERIMENTAL FARMS

REPORTS

OF THE

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HORTICULTURIST		W. T. MACOUN
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" " "	INDIAN HEAD, SASK.	ANGUS MACKAY
" " "	LETHBRIDGE, ALTA.	W. H. FAIRFIELD, M.S.
" " "	LACOMBE, ALTA.	G. H. HUTTON, B.S.A.
" " "	AGASSIZ, B.C.	THOS. A. SHARPE

FOR THE

YEAR ENDING MARCH 31

1908

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APPENDIX

TO THE

REPORT OF THE MINISTER OF AGRICULTURE

ON

EXPERIMENTAL FARMS

OTTAWA, March 31, 1908.

SIR,—I beg to submit for your approval the twenty-first annual report of the work done, and in progress, at the several experimental farms.

In addition to my own report, you will find appended reports from the following officers of the Central Experimental Farm:—From the Agriculturist, Mr. J. H. Grisdale; from the Horticulturist, Mr. W. T. Macoun; from the Chemist, Mr. Frank T. Shutt; from the Entomologist and Botanist, Dr. James Fletcher; from the Cerealist, Dr. C. E. Saunders, and from the Poultry Manager, Mr. A. G. Gilbert.

From the branch experimental farms there are reports from Mr. R. Robertson, Superintendent of the Experimental Farm for the Maritime Provinces, at Nappan, Nova Scotia; from Mr. James Murray, Superintendent of the Experimental Farm for Manitoba at Brandon; from Mr. Angus Mackay, Superintendent of the Experimental Farm for Saskatchewan at Indian Head: from W. H. Fairfield, Superintendent of the Experimental Farm for Southern Alberta at Lethbridge; from G. H. Hutton, Superintendent of the Experimental Farm for Central Alberta at Lacombe, and from Mr. Thomas A. Sharpe, Superintendent of the Experimental Farm for British Columbia, at Agassiz.

In these reports there will be found the results of many important and carefully conducted experiments in agriculture, horticulture and arboriculture, the outcome of practical and scientific work in the fields, barns, dairy and poultry buildings, orchards and plantations at the several experimental farms; also of scientific research in connection with the breeding of cereals and in determining their relative value; also of research work in the chemical laboratories bearing on many branches of agricultural and horticultural employment; and of information gained from the careful study of the life histories and habits of injurious insects and the methods by which noxious weeds are propagated and spread, together with the most practical and economical measures for their destruction. In the report of the Entomologist and Botanist will also be found particulars of the experiments and observations which have been made during the past year in connection with the apiary.

The large and constantly increasing demand by the farmers of the Dominion for the publications issued from the experimental farms, the rapidly extending correspondence, and the readiness shown by farmers everywhere to co-operate with the work of the farms in the testing of new and promising varieties of cereals and other farm crops, furnish gratifying evidence of the desire for information among this class of the community, also of the high esteem in which the work of the farms is held. It is hoped that the facts brought together in the present issue will be found of much practical value to the Canadian farmer and fruit-grower, and that they may assist in advancing agriculture and horticulture in this country.

I have the honour to be, sir,
Your obedient servant,

WM. SAUNDERS,
Director of Experimental Farms.

To the Honourable
The Minister of Agriculture,
Ottawa.

ANNUAL REPORT OF THE EXPERIMENTAL FARMS

For the year ending March 31 1908

REPORT OF THE DIRECTOR

WM. SAUNDERS, C.M.G., LL.D., F.R.S.C., F.L.S.

The greater part of the crops in most of the provinces of Canada in 1907 were below the average.

In Ontario the cold and backward spring was followed by unusually dry weather which resulted in a very light hay crop, the average for the province being 1·18 tons per acre, whereas the average for this crop for the past 25 years has been 1·47 tons per acre. The area occupied by hay in 1907 was increased 219,635 acres, nevertheless there was a decrease in the total of 792,762 tons. Oats which in this province stands next to hay in importance, occupied also an increased area of 215,798 acres, but the total crop as reported was nearly 25 million bushels less than last year. The winter wheat and spring wheat crops were both somewhat above the average, most other important farm crops were below the average. The high prices which prevailed for all kinds of farm produce, helped in many cases to make up for the shortage in weight of crop. The scantiness of the pastures caused a falling off in the production of cheese and butter, which brought about a serious reduction in the volume of exports.

In Quebec the agricultural conditions were much the same as in Ontario. A late cold spring followed by unusually dry weather brought a very light hay crop. The crops of grain in many districts were medium, in others they were distinctly below the average. The pastures were poor and both dairying and grazing suffered.

In the maritime provinces the spring was also cold and wet, and seeding was very late. The earliest sown grain at the Experimental Farm at Nappan was on May 20 and in many parts of these provinces the grain was not all sown until early in June. Notwithstanding this late seeding the favourable weather which occurred later brought the crops along very rapidly and most of them turned out fairly well. Oats gave a larger return than in 1906, and the Nova Scotia apple crop is estimated at a value of two million dollars.

In Manitoba spring work was also delayed by much cold and wet weather. At the Experimental Farm at Brandon the first spring wheat sown was on May 6, which was more than two weeks later than usual. The sowing of oats began on May 20, and barley on May 27. In spite of this lateness in seeding the crops under the influence of more favourable weather, which occurred later, made rapid progress and most of them matured before frost occurred.

At Indian Head in Saskatchewan, the cold and backward weather made seeding very late. The sowing of wheat began May 6, oats May 14, and barley a day or two later. This was about three weeks later than the average. Low temperatures and wet weather prevailed also during the ripening period which retarded very much the ripening of the grain so that when frost occurred on September 12 after heavy rains, most of the grain was more or less injured, the wheat suffering most severely and in yield the crops fell very much below those of the previous year.

At Lacombe, in Central Alberta, seeding began a little earlier. Wheat was sown on May 1 and oats and barley from May 4 to May 10, while the grain at this branch farm was sown earlier, this advantage was more than counterbalanced by the earlier appearance of frost in the autumn. Frosts occurred on the nights of August 10 and 21 and all varieties of wheat were more or less frosted, they were also deficient in weight and low in vitality.

At Agassiz in the coast climate of British Columbia where grain is usually sown early, the first grain owing to cold and wet weather was not put in until April 18. Hot weather during June, July and the first half of August hastened the ripening of the crops and the results were fully up to the average.

SOME EXPERIMENTS IN AGRICULTURE AND HORTICULTURE AT FORT VERMILION ON THE PEACE RIVER.

Public attention of late has been much called to the probable agricultural value of much of the 'Great North Land' in Canada and more particularly to the northern part of the province of Alberta. The area of land unoccupied and unsurveyed there is enormous, extending from Athabasca Landing to the 60th parallel of latitude. While it is known that much good land is to be had within that area, the question as to the probable proportion of land suitable for general crop growing there has elicited considerable difference of opinion and probably no part of that country has been so often discussed as the large belt comprising the Peace River district. Good wheat has been grown in many parts of that country and much of this area is claimed to be very suitable for grain growing and ranching.

In April, 1907, Mr. F. S. Lawrence, of Fort Vermilion, on the Peace river, who has had experience in farming in that district, visited Ottawa, when an arrangement was made with him to carry on some experimental work in agriculture and horticulture in that locality. This settlement, which is about 350 miles in a direct line north of Edmonton, is nearly 700 miles by the ordinary travelled route. Farming has been carried on there for many years and wheat has been grown so successfully that the Hudson Bay Company have built there a roller process flour mill with a capacity of about 25 bbls. of flour per day, so that flour may be had at this far northern point to supply the posts situated still further north and thus save the long haul from Edmonton. The quantity of wheat produced in this district in 1906 has been estimated at 25,000 bushels. Samples received that season from this locality were plump and well matured, weighing from 62 to 64 lb. per bushel.

Among the early ripening varieties of wheat which were brought to Canada by the Central Experimental Farm for test, was the Ladoga. This was introduced in 1887, having been obtained from the Lake Ladoga district near St. Petersburgh, where this variety is largely grown and much esteemed. After many trials in different parts of Canada this wheat was shown to be about a week earlier in ripening than the Red Fife, but not equal to that variety in quality. Furthermore the flour made from Ladoga wheat was of a yellowish tint, which was objectionable to millers, especially for flour intended for export, and for these reasons its cultivation was discouraged in the larger wheat-growing districts. Samples, however, were sent from the Experimental Farm to the settlements on the Peace river at the request of the farmers who had gone there, and this variety succeeded so well and ripened so early that it soon became the leading sort in cultivation, and now most of the wheat grown at Fort Vermilion is the Ladoga. Oats and barley also grow well in that district and it is claimed that clovers and grasses also do well there. The altitude at Fort Vermilion is much less than it is further up the river. At Dunvegan, for example, it is about 2,000 feet, while at Fort Vermilion it is only 950 feet. At Fort Vermilion there are Anglican and Roman Catholic missions where schools have been established at which both native and white children are educated.

The seeds of many varieties of grain, fodder-plants, vegetables, also fruits, trees, shrubs and plants were got together in April and carefully packed and forwarded to Edmonton by express in time to go by the first boat. It was expected that navigation would be open about April 25, but the season was late and as there was no immediate prospect of the breaking up of the rivers, and it was important that the seeds and plants should reach their destination as early as possible, Mr. Lawrence made arrangements to drive across the country to Peace River Landing.

With reference to this undertaking, Mr. Lawrence reports as follows:—

Pursuant to your instructions, I left Edmonton on the 1st day of May and drove by way of Lesser Slave lake to the Peace River crossing. It was necessary to go with teams, as owing to the lateness of the season, the boats were not yet running and I had with me the supplies for the work, including the trees and seeds. The journey was made with all possible speed, but just at the breaking up of winter it was difficult to make good time, the higher grounds being covered with mud, and the lower with water and snow. To Athabasca Landing the roads were fair when compared with what followed. From this point we drove along the south bank of the Athabasca river to the junction of the Lesser Slave. Here the wagon and load were ferried across piecemeal, by means of a leaky skiff and the horses had to swim. There was some ice running, but we found water enough to cross in. Here the road ran along the north bank of the Slave river. Arriving at the east end of Lesser Slave lake, it was found to be necessary to travel around the north shore and to lighten the load, as the horses were getting tired, so an Indian with team and wagon was hired and the load divided.

From the west end of the lake, we again took all the load and travelling over roads in bad condition, Peace River crossing was reached on the evening of the 17th, and the 400 mile drive over. Here a small raft was secured and fitted up, and the supplies loaded on it. At 12.30 noon, the 18th, the raft was pushed off into the stream, and for the 300 miles was never stopped. Fort Vermilion was reached at 5 a.m. on the 21st of May. With as little delay as possible a site was selected and work begun. This was pushed as rapidly as possible and by the 1st of June the seeds were practically all in and the land fenced.

The site chosen for this work lies on the bench land away from the river. The soil is a sandy loam, and was broken the previous summer in June to a depth of 5 inches.

The winter of 1906-7 was an unusually severe one, with heavy snow-fall, severe cold and some storm, followed by a late cold spring. Snow stayed on the ground until the beginning of May and seeding began from the 8th to the 15th in places. The weather continued cold with east winds during the latter part of May and there was no rainfall. Owing to this particularly unfavourable spring there was little hope felt by the farmers of the district for a successful wheat crop, but about the usual acreage was sown. The spring drouth was broken by light showers on the 7th of June and throughout the months of June and July, the long days or the almost continual daylight, with frequent showers and hot weather produced a marvellous growth. By the 1st of August the prospects were very bright for a heavy crop, but as a ripening month August was a disappointment, and the grain although well filled, did not harden rapidly, and on the 30th a frost of 3·3 degrees did considerable damage to the later sown grain. About one-third of the wheat throughout the district which was sown early is good, the balance more or less frozen, much of it being suitable only for feed. September came in hot and dry and the weather was favourable for the harvesting of the wheat crop. Barley cutting began in the earliest sown grain in this district on August 20, wheat cutting on the 27th. Grasshoppers appeared in rather unusual numbers and destroyed many of the vegetables and grasses. They did not do much damage to the large fields of grain but injured the small plots. Native fruits yielded abundantly, especially strawberries and raspberries.

Nine varieties of spring wheat were sown on the 25th of May and headed from

21st to 29th of July, but all were injured by frosts on August 30. Six varieties of oats were sown on May 27. They were headed July 24 to 27, but were not matured before frost. Six varieties of barley sown May 27 headed July 18 to 21, but were not fully ripe when frost occurred.

Mr. Lawrence sent to Ottawa in September several cases of samples, mostly of grain in the straw, grown on the experimental plots at Fort Vermilion from the seed supplied from the Central Experimental Farm, concerning which as soon as they came to hand the following notes were made. These throw light on the character of the growth and the degree of maturity reached at the time frost occurred.

SPRING WHEAT.

Red Fife H (a selected form produced at Ottawa, which usually ripens earlier than the ordinary Red Fife).—Straw, 51 inches long, green, kernel soft and much shrivelled.

Bishop (one of the early maturing cross-bred sorts not yet distributed).—Straw, 49 inches long, green, kernel of fair size but soft and shrivelled.

Bobs (an early ripening variety from Australia).—Straw, 45 inches long, yellowish green, kernels soft and shrivelled.

Preston.—Straw, 54 inches long, green, kernels fairly firm, a few of them plump, but mostly shrivelled.

Percy.—Straw, 53 inches long, green, kernel fairly large, but soft and shrivelled.

Ladoga grown at Fort Vermilion, but sown late with the other samples.—Straw, 49 inches long and greenish, kernels small soft and much shrivelled.

Pringle's Champlain.—Straw, 45 inches long, greenish yellow, kernels small, soft and much shrivelled.

DURUM WHEATS.

Roumanian.—Straw, 55 inches long, green, kernels small and much shrivelled.

Mahmoudi.—Straw, 55 inches long, green, kernels large, soft and shrivelled.

EMMER.

Common Emmer.—Straw, 46 inches long, bright yellow, kernel small and shrivelled.

OATS.

Tartar King.—Straw, 53 inches long, green, kernels rather large, but soft.

Improved Ligowo.—Straw, 54 inches long, greenish yellow, kernels fairly well developed.

Daubeney.—Straw, 45 inches long, yellow, kernels well developed, but rather soft.

Banner.—Straw, 54 inches long, green, kernels well developed, but soft.

Golden Beauty.—Straw, 53 inches long, yellowish green, kernels fairly well developed, but soft.

BARLEY.

Manchurian A (a new early strain produced by the Cerealist at the Central Farm). —Straw, 46 inches long, yellowish, kernels fairly ripe.

Odessa.—Straw, 47 inches long, yellow, kernels firm and of fair size.

Claude.—Straw, 46 inches long, bright yellow, kernels large, firm and plump.

Sidney.—Straw, 47 inches long, bright yellow, kernels of medium size and firm.

Canadian Thorpe.—Straw, 44 inches long, yellowish, kernel large and fairly firm.

From these particulars it is evident that had the varieties of grain referred to been sown a fortnight earlier most of them would in all probability have ripened and been harvested before the frost of August 30. This is very encouraging.

Several good samples of wheat and barley which were well ripened were obtained by Mr. Lawrence from settlers in the Fort Vermilion district. These were sown about the 8th of May and cut on the 27th of August.

Four varieties of Indian corn were sown May 24, Longfellow, North Dakota White, Compton's Early and Selected Leaming. These were all tasselled, and the Selected Leaming was 60 inches in height when cut by frost.

A number of varieties of grasses and clovers were sown May 27 and most of them were well up by June 10 to 14. All were eaten to the ground by grasshoppers and there was no poison to be had in the country whereby their ravages might have been lessened.

Cabbages, cauliflowers, table carrots and table turnips were all injured by grasshoppers.

Lettuce, Black-Seeded Simpson, sown May 29, were large enough for use July 8. Cabbage lettuce sown May 29, fit for use July 3, and Hanson lettuce sown May 29, was fit for use July 5.

Beans, Improved Golden Wax, Extra Early Refugee and Refugee, were the varieties tested. Extra Early Refugee began to bloom July 24, and the pods were filled, but soft, when cut by frost August 30. Improved Golden Wax was in bloom July 21, and pods were well filled and beginning to ripen by August 30. Refugee was in bloom July 26, and pods were well formed, but beans were not fully formed when frost occurred.

Four varieties of field turnips were sown on June 3, and were up June 12 and 13. Two sorts each of field carrots, sugar beets and garden beets, sown at the same time, were all more or less injured by grasshoppers.

Two varieties of radish, French Breakfast and Early Scarlet, were sown May 29 were up June 7, and were large enough for use July 8 to 12.

Two varieties of tomato were tried, Sparks' Earliana and Dominion Day. These were sown May 28, were up June 20 and were budding August 25, were cut by frost on 30th.

Four varieties of potatoes were under trial, but the leaves were injured by grasshoppers in the early part of August, hence there was but small results. They were dug on the 14th of September. The 3 lbs. of Burpee's Extra Early planted gave 16¼ lbs., and 3 lbs. of Everett gave a crop of 11 lbs. No report was received of the other two varieties.

FRUITS.

In the collection of fruits tested the following were included:—

Seven varieties of Hardy Russian apples: 2 Varna, 2 Charlamoff, 2 Jarvis, 2 Morden, 2 Osler, 2 Rupert and 2 Hibernal, 14 trees in all.

Ten varieties of cross-bred apples: 2 each of Alberta, Charles, Tony, Prince, Eve, Golden, Magnus, Pioneer, Silvia and Robin, 20 trees in all.

Nine varieties of seedlings of cross-bred apples: 4 each seedlings of Alberta, Tony, Prince, Golden, Magnus, Pioneer, Silvia, Robin and Jewel, 36 trees in all.

Six varieties of plums: 2 Cheney, 1 Bixby, 1 Aitken, 1 Mankato, 1 Odegard and 4 seedlings of Carsterson, 10 trees in all.

Eleven varieties of black currants: 2 bushes each of Topsy, Kerry, Ontario, Saunders, Eagle, Eclipse, Magnus, Ethel, Climax, Norton and Bang Up, 22 bushes in all.

Nine varieties of red currants: 2 bushes each of Red Dutch, Long-bunched Holland, Greenfield, Large Red, Rankin's Red, Simcoe King, Goliath, Cumberland Red and Moore's Seedling, 18 bushes in all.

Five varieties of white currants: 2 bushes each of White Cherry, Large White, White Kaiser, White Dutch and White Grape, 10 bushes in all.

Four varieties of raspberries: 12 plants each of Herbert, Sarah, Brighton and Heebner, 48 plants in all.

Five varieties of strawberries: 100 plants each of Beder Wood, Williams, Poco-

moke, Lovett and Parson's Beauty, 500 plants in all. These varieties were all chosen on account of their hardiness.

HARDY TREES, SHRUBS AND PLANTS.

A fine collection of hardy trees and shrubs was also sent, including more than one hundred varieties, also an assortment of perennial plants and hardy climbers.

A large percentage of these fruits and ornamental trees, notwithstanding the delays in transporting them in the spring, survived and made very fair growth.

With late sowing and an unfavourable season it is not surprising that none of the experimental plots of grain fully ripened in 1907. On his way to Edmonton in the autumn Mr. Lawrence secured at Peace River Landing further samples of well-matured wheat, barley and oats, he also found samples of squash, pumpkins, citrons, cucumbers and potatoes. These he had photographed in Edmonton and they are reproduced in this report.

The following are the measurements made by Mr. Lawrence of these samples:—

Squash, length 12 inches, circumference 33½ inches, weight 14½ pounds.

Pumpkin, length 10 inches, circumference 37¾ inches, weight 10 pounds.

Citron, circumference 17 inches, weight 2½ pounds.

Cucumber, length 8 inches, diameter 2¾ inches, weight 1 pound.

The size and weight of the potatoes were not given, but it is evident from the photograph that they were very fine specimens.

I submit herewith such meteorological records as are obtainable in connection with this work.

MAXIMUM AND MINIMUM TEMPERATURES FOR SUMMER MONTHS OF 1906 AND 1907, AT FORT VERMILION.

Date.	Degree.	Date.	Degree.	Total Rainfall.	Snowfall.	Bright Sunshine.
1907.	Maximum.		Minimum.	Inches.	Inches.	
April 19	52·0	10	12·5	....	4·25	....
May 26	77·8	7	14·0	No rainfall....	4·5	Not recorded..
June 23	89·2	1	35·5	2·15	....	248.8
July 11	83·	17	37·6	3·49	....	274·3
August 2	81·5	30	28·7	·99	....	238·8
September 3	83·5	26	19·6	·64	Flurry on 14th	....
1906.						
April 30	68·3	1	14·5	·15	2·12	....
May 31	81·0	7	23·5	·28	....	....
June 24	89·	2	37·5	3·93	....	....
July 2	93·7	16	40·8	·59	....	....
August 6	82·5	28	28·5	·88	....	....
September 1	71·	25	21·5	2·38	....	....

MAXIMUM AND MINIMUM TEMPERATURES FOR WINTERS OF 1906 AND 1907, AT FORT VERMILION.

——	Maximum.	Date.	Minimum.	Date.	——
	°		°		
November, 1906	41·5	26th	—17·8	21st	6 in. snow on ground.
December, 1906	22·8	27th	—50·0	5th	Snow on ground.
January, 1907	20·2	9th	—55·8	20th	" "
February, 1907	....	....	—49·5	24th	
March, 1907	22·0	27th	—23·2	25th	" "

RECORD OF SUNSHINE AT FORT VERMILION, PEACE RIVER DISTRICT, ALTA., FROM JUNE 1, TO OCTOBER 31, 1907.

Month.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.	Highest Sunshine per day.	Date.	Lowest Sunshine per day.	Date.
June	30	0	248·9	8·29	15·0	27th.	0·1	9th.
July	29	2	274·3	8·84	15·3	16th.	0·0	2nd., 6th.
August	28	3	228·8	7·38	13·3	23rd.	0·0	16th, 26th, 29th.
September	25	5	187·2	6·24	12·7	5th.	0·0	9th, 10th, 15th, 16th, 30th.
October	29	2	174·2	5·61	10·8	2nd.	0·0	19th, 25th.

These records of sunshine are very interesting, showing as much as $15\frac{3}{10}''$ hours on July 16. These very long days of sunshine have an important influence in the rapid ripening of grain.

SOME WEATHER OBSERVATIONS TAKEN AT THE C. E. F. OTTAWA, AS COMPARED WITH THOSE TAKEN AT FORT VERMILION, PEACE RIVER DISTRICT, ALBERTA.

—	Mean Temp.	Highest Temp.	Lowest Temp.	Rain fall.	Heaviest in 24 hours.
	June, 1907.				
	°	°	°	°	°
Ottawa	65·12	95·8	40·7	2·20	0·86
Fort Vermilion	59·09	89·2	35·5	2·13	0·47
	July, 1907.				
Ottawa	67·37	87·0	44·5	3·73	0·85
Fort Vermilion	60·84	83·0	37·6	3·49	1·04
	August, 1907.				
Ottawa	63·05	93·3	39·0	1·13	0·35
Fort Vermilion	56·02	81·5	28·7	1·09	0·35

TABLE SHOWING MAXIMUM, MINIMUM AND MEAN TEMPERATURES FOR THE MONTHS MAY, JUNE, JULY, AUGUST AND SEPTEMBER, 1906-07, ALSO HIGHEST AND LOWEST TEMPERATURES DURING EACH MONTH, AT FORT VERMILION, PEACE RIVER DISTRICT, ALTA.

Month.	Maximum.	Minimum.	Mean.	Highest.	Date.	Lowest.	Date.
1906.	°	°	°	°		°	
May	62·17	35·48	48·83	81·0	31st	23·5	7th
June	72·85	49·61	62·04	89·0	24th	37·5	2nd
July	81·54	52·11	66·82	93·7	2nd & 3rd	40·8	16th
August	70·30	42·71	56·48	82·5	5th	28·5	28th
September	56·80	35·16	45·97	71·5	1st	21·5	25th
1907.							
May	53·32	30·68	41·90	77·5	26th	14·0	7th
June	71·48	46·06	58·77	89·2	23rd	35·5	1st
July	71·98	47·29	62·58	83·0	11th	37·6	17th
August	71·43	40·63	56·10	81·5	2nd	28·7	30th
September to 27th	59·46	34·65	46·98	83·5	3rd	19·6	26th

At the close of the season of 1907, Mr. F. S. Lawrence gave up this work to accept a more lucrative position. Since then Mr. Robert Jones, of Fort Vermilion, has agreed to carry on these experiments. Mr. Jones is a practical farmer, who has had a long experience in the Peace River country. It is hoped that the present season may be more favourable than that of 1907 and that much success may attend the efforts made.

JOURNEYS THROUGH THE WEST.

PORTAGE LA PRAIRIE TO YORKTON.

In my report for 1906, I submitted some notes under the above heading on the character of the country from point to point, taken when travelling over certain districts, these notes referred only to the lands along the line of railway, such as could be seen from the train. A similar course was followed this year in a journey from Portage la Prairie to Yorkton.

PORTAGE LA PRAIRIE TO MACDONALD, 10 MILES.

This is almost a continuous wheat field, a very fine area for grain, fertile and productive. Macdonald is a small town which seems to be growing, but slowly.

MACDONALD TO WESTBOURNE, 7 MILES.

The wheat lands here do not extend more than two or three miles beyond Macdonald, most of the land beyond this to near Westbourne is used for grazing and the production of hay. The surface is uneven and there are here and there fields where the land is higher, which are devoted to grain.

WESTBOURNE TO WOODSIDE, 10 MILES.

There is a large quantity of unbroken land between these two points, not much grain is grown, the land being chiefly used for pasture. Probably most of this is too wet in spring for grain.

WOODSIDE TO GLADSTONE, 8 MILES.

Considerable areas of land are broken in this district, the soil seems rather light and some of it a little gravelly. Country covered with scattered bluffs on which the wood is small. As Gladstone is approached there are large areas of land in crop. Towards Woodside there is much land unbroken, much of the soil light and gravelly. Many cattle are kept in this district.

The town of Gladstone is very much wooded, which furnishes shelter for any trees or shrubs which may be planted, also for small fruits and vegetables. Many of the houses are embowered in trees, other parts of the town are more open. There are many pretty gardens. Some large wheat fields near the town on both sides, but especially northwest.

GLADSTONE TO KEYES, 9 MILES.

In this area there are many large fields in crop, but some of the land looks light. Country considerably broken with clumps of willow, poplar, &c., there is a large district untillled towards Keyes.

KEYES TO ARDEN, 8 MILES.

Keyes is a small place, not growing much. There is more or less crop scattered over this district, much land unbroken towards Arden.

ARDEN TO NEEPAWA, 9 MILES.

Arden is a good-sized town and seems to be thriving. A considerable quantity of grain is grown near the town, but a large proportion of the land has not yet been brought under the plough.

Neepawa is a thriving town, with an open and an extensive view from the railway, with wheat fields almost as far as the eye can reach. This is a great wheat-producing district.

NEEPAWA TO FRANKLIN, 9 MILES.

Between these towns there is a large area of wheat intermixed with some bluffy and some low spots, subsoil mostly gravelly. Franklin is a nice-sized town, and seems to be growing fairly well.

FRANKLIN TO EAST SUMMIT, 4 MILES.

Through this district the soil seems to be very good. There is a large acreage of wheat in sight on both sides of the track followed by a quantity of scrubby wood land and some low hay lands.

EAST SUMMIT TO MINNEDOSA, 4 MILES.

Approaching Minnedosa there is a considerable quantity of crop, the country becomes more undulating and broken, soil light and gravelly, especially on the hills. Minnedosa has grown much within the past few years, some new houses now going up, but not many.

MINNEDOSA TO WEST SUMMIT, 5 MILES.

Land light, very uneven and more or less stony. Railway here runs along the valley of Bird Tail creek.

WEST SUMMIT TO BASSWOOD, 5 MILES.

Land continues light and more or less stony, not much of it under cultivation. There are a few fields of grain near West Summit. Basswood is a fair-sized place. but does not appear to be making much progress.

BASSWOOD TO NEWDALE, 8 MILES.

Not much land under crop, very little breaking, land somewhat bluffy, with some sloughs.

NEWDALE TO STRATHCLAIR, 10 MILES.

In this district there is a succession of grain fields, oats and wheat. Soil mostly light with a gravelly subsoil and a number of sloughs. Land rolling, near Strathclair it becomes of better quality. This town is not making rapid growth, but has attained a fair size.

STRATHCLAIR TO SHOAL LAKE, 8 MILES.

Much of this district is low and wet with very small lakes alternating with higher ground and grain fields, mostly oats. Soil mostly light with subsoil more or less gravelly. Shoal Lake is a good-sized town alongside of a large shallow lake.

SHOAL LAKE TO KELLOE, 9 MILES.

The land in this locality is of much better quality. There are fine fields of wheat and oats with very few sloughs, some land more or less stony. Stone piles observed in some of the fields. Kelloe has only a few houses.

KELLOE TO SOLSGIRTH, 8 MILES.

Some fine farms in this district with higher ground in grain fields and on lower ground rich grassy lands with occasional sloughs and more or less stone. Solsgirth seems to be a nice little town, most of the houses are neat in appearance and well painted.

SOLSGIRTH TO BIRTLE, 8 MILES.

The country lying between these towns is hilly and rolling, soil mostly light and gravelly, with many large stones. Here the railway goes down into the valley of a small river. The valley is well wooded, land uneven and stony, but little land here under crop.

BIRTLE TO FOXWARREN, 8 MILES.

A few good fields of grain, much of this district more or less broken and some of it very stony. As Foxwarren is approached the land becomes better. Foxwarren is a fair-sized town making good progress. This seems to be a very good district.

FOXWARREN TO BINSCARTH, 9 MILES.

Many large fields of grain, soil of good quality. Binscarth is a good-sized town, with a number of new buildings mostly brick, a considerable quantity of wheat is grown in this neighbourhood. A branch line of railway has been built here running out eleven miles to Russell.

BINSCARTH TO MILLWOOD, 8 MILES.

Shortly after leaving Binscarth the railway begins to descend into the valley of the Assiniboine and the valley level is reached about Millwood, near which the Assiniboine is crossed on an iron bridge, the land here is much broken and hilly and very little grain is seen. Millwood is a small place and does not appear to be growing.

MILLWOOD TO HARROWBY, 5 MILES.

The railway here runs along the bank of the river until near Harrowby. There are a few small fields of grain in sight, but much of the land is light and gravelly with a stony subsoil.

HARROWBY TO LANGENBURG, 13 MILES.

Some good farms in this district with good crops. Land fairly level and of good quality. Langenburg is a good-sized town and is growing. This is in the midst of a large German settlement.

LANGENBURG TO CHURCHBRIDGE, 9 MILES.

Not a large proportion of land under cultivation between these points although it is fairly level and the soil seems to be of good quality. Churchbridge is a nice town, smaller than Langenburg, but growing. Land near the town considerably broken by woods and sloughs and the soil becomes lighter after leaving Churchbridge.

CHURCHBRIDGE TO BREDENBURY, 7 MILES.

Country fairly level, but soil rather light and very little of it is under crop. Bredenbury is a very small place and does not seem to be growing.

BREDENBURY TO SALTCOATS, 9 MILES.

Land gently undulating, rather thickly dotted with bluffs of poplar and willow Land rather light and stony in places. As Saltcoats is approached the land becomes much better and there is a large area under crop. Near that town is a large lake.

SALTCOATS TO ROKEBY, 10 MILES.

This is a fine piece of country with a long stretch of fields in crop with wheat and oats. Quite a large area newly broken. Rokeby is a very small town and is perhaps too near to Yorkton to expect much growth.

ROKEBY TO YORKTON, 7 MILES.

This is a very good district in which a large quantity of grain is grown, principally wheat and oats. All around Yorkton for many miles the soil appears to be very rich and fertile producing large crops of grain of excellent quality. It is a thriving town, the centre of a large and prosperous grain-growing district.

CO-OPERATIVE EXPERIMENTS BY FARMERS THROUGHOUT CANADA.

A further distribution was made this year from the Experimental Farms to Canadian farmers of samples of seed of high quality for the improvement of crops. The object in view was to ascertain by test the relative merits of the different sorts under trial as to quality, productiveness and earliness in ripening. In conducting these trial plots farmers everywhere have readily undertaken to co-operate with the experimental farms and to report the results of their experience. These joint efforts have been productive of much good and much information has thus been gathered as to the suitability of these different varieties to the climatic conditions prevailing in different parts of Canada.

During the season of 1907 the number of Canadian farmers who have united in these experiments was 45,565. The value of this work in all parts of the Dominion has been abundantly demonstrated.

The samples sent from the Central Farm have weighed as follows: Wheat and barley, five pounds each, and oats, four pounds, sufficient in each case to sow one-twentieth of an acre. The samples of Indian corn, peas and potatoes have weighed three pounds each.

DISTRIBUTION BY PROVINCES.

Name of Grain.	Prince Edward Island.	Nova Scotia.	New Brunswick.	Quebec.	Ontario.	Manitoba.	Saskatchewan.	Alberta.	British Columbia.
Oats	830	1,131	1,665	5,670	2,710	430	785	366	92
Barley	129	402	248	1,775	812	260	289	188	31
Wheat	387	550	671	2,626	536	728	1,664	548	59
Peas	13	68	51	340	66	40	26	16	3
Indian corn	31	112	235	548	275	55	60	38	29
Potatoes	233	1,213	1,444	3,344	4,262	890	1,725	880	656
Total	1,623	3,476	4,314	14,303	8,661	2,343	4,549	2,036	870

Total number of samples distributed, 42,175.
Number of applicants supplied, 42,074.

Total number of packages of each sort distributed :—

Oats	13,679
Barley	4,074
Wheat	7,769
Peas	623
Indian corn	1,383
Potatoes	14,647
Total	42,175

The following list shows the number of packages which have been sent of the different varieties :—

Name of Variety.	Number of Packages.
Oats.	
Banner	4,594
Improved Ligowo	2,045
Danish Island	1,960
Wide Awake	1,833
White Giant	1,265
Thousand Dollar	796
Goldfinder	401
Tartar King	374
Waverley	314
Welcome	97
Total	13,679
Barley (Six-rowed.)	
Mensury	1,540
Mansfield	717
Claude	562
Odessa	537
(Two-rowed.)	
Standwell	309
Invincible	275
Canadian Thorpe	106
Sidney	28
Total	4,074
Peas.	
Arthur	375
Golden Vine	218
Daniel O'Rourke	30
Total	623

Name of Variety.	Number of Packages.
Spring Wheat.	
Red Fife	3,434
Preston	1,499
Pringle's Champlain	1,423
White Fife	750
Percy	330
Stanley	235
Huron	98
Total	7,769
Indian Corn.	
Longfellow	408
Angel of Midnight	331
Selected Leaming	241
Compton's Early	201
North Dakota White	132
White Cap Yellow Dent	70
Total	1,383
Potatoes.	
Early White Prize	2,708
Rochester Rose	2,649
Carman No. 1	2,561
Late Puritan	1,206
Gold Coin	1,177
Uncle Sam	807
Everett	796
Money Maker	685
Bovee	657
Queen of Hebron	544
Burnaby Mammoth	539
Vick's Extra Early	318
Total	14,647

DISTRIBUTION OF SAMPLES FROM THE BRANCH EXPERIMENTAL FARMS.

Samples were also distributed from the Branch Experimental Farms as follows :—

Experimental Farm, Nappan, N.S.—	
Spring wheat	78
Oats	190
Barley	74
Peas	36
Potatoes	275
Buckwheat	20
	673
Experimental Farm, Indian Head—	
Spring wheat	252
Oats	312
Barley	116
Peas	58
Flax, rye and spelt	8
Potatoes	600
	1,346
Experimental Farm, Brandon, Man.—	
Grain of all sorts	162
Potatoes	452
	614
Experimental Farm, Agassiz, B.C.—	
Spring wheat	25
Oats	106
Barley	92
Peas	95
Indian corn	36
Nuts, tree seeds and bulbs	393
Potatoes	10
	757

Specimens of vegetables grown at Peace River Crossing, Alberta.

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By adding the number of farmers supplied by the branch farms to those supplied by the Central Farm, we have a total of 45,565. The average number of samples sent out each year for the past eleven years has been over 38,000.

It is remarkable how rapidly a supply of grain may be built up from a single four or five-pound sample. Take for instance, a sample of oats. The four pounds received will, if well cared for, usually produce from three to four bushels. This sown on two acres of land will at a very moderate estimate give one hundred bushels, and sometimes much more, but taking the lower figure as the basis for this calculation, the crop at the end of the second year would be sufficient to sow fifty acres, which at the same moderate computation would furnish 2,500 bushels, available for seed or sale at the end of the third year.

The critical point of these tests is the threshing of the grain at the end of the first season, and it is here that some farmers fail to get the full advantage of the experiment. The product of the one-twentieth acre plot is sometimes threshed in a large machine, which it is difficult to thoroughly clean, and in this way the grain becomes mixed with other varieties and with weed seeds and is practically ruined. At the Central Experimental Farm we thresh the produce of many of the small plots of grain by cutting off the heads, placing them in sacks and beating them with a stick, and winnowing until most of the chaff is got rid of, and the grain made clean enough for sowing.

Where the farmer is to use this seed for his own sowing it is not necessary that the sample be entirely free from chaff. It is, however, most essential if he is to get the full benefit of his experiment, that the grain be quite free from all admixture with other sorts of grain or of weeds. Farmers are expected to harvest the product of their experimental plot separately, and store it away carefully, threshing it by hand either with a flail or in such other manner as they may prefer. The results to be gained will abundantly repay the cost of careful handling of the grain.

Every season after the regular free distribution of the samples has been provided for the surplus grain grown on the experimental farms not required for sowing is sold to farmers in quantities of from 2 to 6 bushels or more each. In this way a considerable number of farmers are supplied every year with seed grain in these larger quantities, especially from the branch farms at Brandon and Indian Head.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

In the Annual Report of the Experimental Farms for 1893, details were given on pages 8 to 24 of the results of a series of tests which had then been carried on for some years with the object of gaining information regarding the effects which follow the application of certain fertilizers and combinations of fertilizers on the more important farm crops.

These experiments have been continued and a summary of the results obtained has been given each year, taking the average yield of crops from the beginning, adding the results for the current year, and then giving the average yield for the full time. These tests were undertaken on virgin soil, on a piece of land which was cleared for the purpose. For particulars regarding the clearing and preparing of the land for crop in 1887-88 and its subsequent treatment, the reader is referred to the earlier issues of this report.

VALUABLE INFORMATION GAINED.

From this long conducted series of tests some useful information has been gained.

These trials have shown that barn-yard manure can be most economically used in the fresh or unrotted condition; that fresh manure is equal, ton for ton, in crop-producing power to rotted manure, which, other experiments have shown, loses during the process of rotting about 60 per cent of its weight. In view of the vast importance

of making the best possible use of barn-yard manure, it is difficult to estimate the value of this one item of information.

When these experiments were planned, the opinion was very generally held that untreated mineral phosphate, if very finely ground, was a valuable fertilizer, which gradually gave up its phosphoric acid for the promotion of plant growth. Ten years' experience has shown that mineral phosphate, untreated, is practically of no value as a fertilizer.

Sulphate of iron, which at the time these tests were begun, was highly recommended, as a means of producing increased crops, has also proven to be of very little value for this purpose.

Common salt, which has long had a reputation with many farmers for its value as a fertilizer for barley, while others disbelieved in its efficacy, has been shown to be a valuable agent for producing an increased crop of that grain, while it is of much less use when applied to crops of spring wheat or oats. Land plaster or gypsum has also proved to be of some value as a fertilizer for barley, while of very little service for wheat or oats. Some light has also been thrown on the relative usefulness of single and combined fertilizers.

CHANGES MADE IN THE EXPERIMENTS.

After ten years' experience had demonstrated that finely-ground, untreated mineral phosphate was of no value as a fertilizer, its use was discontinued in 1898. Prior to this it had been used in each set of plots in Nos. 4, 5, 6, 7 and 8, in all the different series of plots, excepting roots. In 1898 and 1899, similar weights of the Thomas' phosphate were used in place of the mineral phosphate, excepting in plot 6 in each series. In this plot the Thomas' phosphate was used in 1898 only.

After constant cropping for ten or eleven years, it was found that the soil on these plots to which no barn-yard manure had been applied was much depleted of humus, and hence its power of holding moisture had been lessened, and the conditions for plant growth, apart from the question of plant food, had on this account become less favourable. In 1899 the experiments were modified and an effort made to restore some proportion of the humus and at the same time gain further information as to the value of clover as a collector of plant food. In the spring of that year ten pounds of red clover seed per acre was sown with the grain on all the plots of wheat, barley and oats. The young clover plants made rapid growth, and by the middle of October there was a thick mat of foliage varying in height and density on the different plots, which was ploughed under. No barn-yard manure was applied on plots 1 and 2 in each series from 1898 to 1905.

In 1900 all the fertilizers on all the plots were discontinued, and from then to 1905 the same crops were grown on all these plots from year to year without fertilizers, sowing clover with the grain each season. In this way some information has been gained as to the value of clover as a collector of plant food, and also as to the unexhausted values of the different fertilizers which had been used on these plots since the experiments were begun. In 1905-6-7 all the fertilizers were again used as in 1898.

SPECIAL TREATMENT OF PLOTS OF INDIAN CORN AND ROOTS.

As it was not practicable to sow clover with the Indian corn and root crops, the sowing of these latter crops was discontinued in the spring of 1900 and clover sown in their places in the proportion of 12 pounds per acre. The clover on these plots made strong growth, so strong as to necessitate twice cutting during the season, the cut clover being left on the ground in each case to decay and add to the fertility of the soil. The clover was left over for further growth in the spring of 1901, and ploughed under for the roots about May 10, and for corn about the middle of that month. Then roots and Indian corn were again sown. In 1902 crops of Indian corn and roots were grown on these plots. In 1903 the land was again devoted to clover and was in Indian corn and roots again in 1904 and each year since.

WHEAT PLOTS.

The seed sown on each of these plots from the beginning has been in the proportion of about 1½ bushels per acre, excepting in 1894; and the varieties used were as follows:—In 1888 to 1891, White Russian, and in 1892-3, Campbell's White Chaff In 1894, Rio Grande was used, and from 1895, to 1907, inclusive, Red Fife. In 1907 the Red Fife was sown May 17, and was ripe August 22.

TABLE I.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT.

Number of Plot	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905–6–7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Nineteen Years. Yield of Grain. Per acre.		Average Yield for Nineteen Years. Yield of Straw. Per acre	20th Season, 1907. Variety, Red Fife. Yield of Grain. Per acre.		20th Season, 1907. Variety, Red Fife. Yield of Straw. Per acre	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure (mixed horse and cow manure), well rotted, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7 15 tons per acre again used..............................	22	36	3888	17	20	2120	22	20 4/20	3800
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre in 1888; 15 tons per acre each year after to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7 15 tons per acre again used....................	22	46 4/19	3928	17	20	1900	22	29 18/20	3827
3	Unmanured from the beginning..........	11	58 8/19	1920	5	40	760	11	39 10/20	1862
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. In 1905-6-7 Thomas' phosphate again used as in 1899........	12	46 1/19	2044	9	40	1180	12	36 15/20	2001
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899......	13	43 18/19	2656	10	00	1320	13	32 15/20	2589
6	Barn-yard manure, partly rotted and actively fermenting, six tons per acre; mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7 fertilizers again used as in 1898	19	18 13/19	3287	14	10	1870	19	31 18/20	3216
7	Mineral phosphate, untreated finely ground, 500 lbs.; nitrate of soda, 200 lbs.; wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899..	14	21 2/19	2644	9	30	1650	14	6 11/20	2594

TABLE I.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF WHEAT—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Nineteen Years. Yield of Grain. Per acre.		Average Yield for Nineteen Years. Yield of Straw. Per acre	20th Season, 1907. Variety, Red Fife. Yield of Grain. Per acre.		20th Season, 1907. Variety, Red Fife. Yield of Straw. Per acre	Average Yield for Twenty Years. Yield of Grain. Per acre.		Average Yield for Twenty Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs.; wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899..	12	$15\frac{15}{19}$	2237	7	40	1080	12	2	2179
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899........	12	$42\frac{5}{19}$	2014	11	40	900	12	$39\frac{8}{20}$	1958
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899..	13	$42\frac{18}{19}$	2879	11	00	1340	13	$34\frac{16}{20}$	2802
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899....	14	$38\frac{4}{19}$	2876	11	50	1490	14	$29\frac{15}{20}$	2806
12	Unmanured from the beginning..	10	$50\frac{16}{19}$	1880	5	10	850	10	$33\frac{16}{20}$	1829
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 bone again used as at first.... .	12	57	2111	8	00	960	12	$42\frac{3}{20}$	2053
14	Bone, finely ground, 500 lbs., wood ashes unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first..	15	$43\frac{13}{19}$	2653	10	20	1420	15	$27\frac{10}{20}$	2591
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first...	14	$23\frac{3}{19}$	2471	10	00	1360	14	$9\frac{17}{20}$	2415
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first..	15	$39\frac{2}{19}$	2306	9	20	1100	15	$20\frac{3}{20}$	2246
17	Sulphate of ammon a, 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first.......	13	$14\frac{11}{19}$	2457	8	40	1380	13	$0\frac{7}{20}$	2403
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first.......	12	$57\frac{6}{19}$	2042	7	10	990	12	$39\frac{19}{20}$	1989
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	13	$59\frac{8}{19}$	1704	7	10	890	13	$38\frac{10}{20}$	1663
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first....	13	$4\frac{17}{19}$	1977	8	10	950	12	$50\frac{3}{20}$	1926
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	13	$25\frac{10}{19}$	1955	11	20	1160	13	$19\frac{5}{20}$	1915

BARLEY PLOTS.

The quantity of seed sown per acre on the barley plots was about 2 bushels in 1889 to 1891, 1½ bushels in 1892 and 1893, and 2 bushels from 1894 to 1907, inclusive. Two-rowed barley was used for seed throughout until 1902, when Mensury, a six-rowed sort, was tried. The varieties used were as follows: 1889 to 1891, Saale; 1892, Goldthorpe; 1893, Duckbill; and in 1894 to 1901, Canadian Thorpe, a selected form of the Duckbill. Since 1902 Mensury has been sown. In 1907 it was sown May 17, and was harvested on August 8.

TABLE II.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Eighteen Years.			19th Season, 1907. Variety, Mensury.			Average Yield for Nineteen Years.		
		Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre	Yield of Grain. Per acre.		Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. In 1905-6-7 15 tons per acre again used..........	37	38 10/18	3086	34	8	1580	37	29 17/19	3007
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. In 1905-6-7 15 tons per acre again used..........	37	47 10/18	3228	38	16	1520	38	8/19	3138
3	Unmanured from the beginning..	15	42 15/18	1525	9	28	660	15	26 17/19	1479
4	Mineral phosphate, untreated, finely ground 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899......	17	27 10/18	1610	10	40	600	17	10 16/19	1557
5	Mineral phosphate, untreated, finely ground 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 500 lbs of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899............	23	5	2253	31	12	1620	23	25 11/19	2220
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7 fertilizers again used as in 1898....	31	2 5/18	2487	37	24	1740	31	18 11/19	2148
7	Mineral phosphate, untreated, finely ground 500 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate was used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899......................	29	15 17/18	2487	35	20	1840	29	30 6/19	2453

TABLE II.—EXPERIMENTS WITH FERTILIZERS ON PLOTS OF BARLEY—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1895-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Eighteen Years.			19th Season, 1907, Variety, Mensury.			Average Yield for Nineteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	24	$25\frac{13}{18}$	1924	24	8	1530	24	$24\frac{15}{19}$	1900
9	Mineral superphosphate No. 1, 500 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899	23	$28\frac{5}{18}$	1798	15	20	1100	23	$7\frac{12}{19}$	1761
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899.	29	$19\frac{2}{18}$	2398	33	36	1600	29	$30\frac{2}{19}$	2357
11	Minera superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899.	29	$8\frac{10}{18}$	2531	37	4	1860	29	$28\frac{10}{19}$	2496
12	Unmanured from the beginning	15	$38\frac{1}{18}$	1269	5	40	640	15	$12\frac{15}{19}$	1236
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1000 to 1905. In 1905-6-7 bone again used as at first......	17	$32\frac{3}{18}$	1424	8	16	480	17	$8\frac{11}{19}$	1375
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first.	25	$44\frac{8}{18}$	2166	21	12	1080	25	$30\frac{6}{19}$	2109
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first.	22	$45\frac{17}{18}$	2203	17	24	1060	22	$32\frac{3}{19}$	2143
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first..	24	$2\frac{13}{18}$	1815	19	8	960	23	$35\frac{16}{19}$	1770
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first..	20	$40\frac{7}{18}$	1880	7	4	780	20	$5\frac{13}{19}$	1822
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905 6-7 fertilizers again used as at first.	20	$39\frac{3}{18}$	1596	11	12	900	20	$15\frac{8}{19}$	1559
19	Common salt (Sodium chloride) 300 lbs. per acre used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	28	$21\frac{15}{18}$	1884	32	44	1560	28	$33\frac{2}{19}$	1867
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first.................. ...	22	$8\frac{6}{18}$	1570	15	20	1020	21	$39\frac{5}{19}$	1521
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first...	22	$41\frac{5}{18}$	1717	11	12	970	22	$11\frac{18}{19}$	1678

OAT PLOTS.

The quantity of seed sown per acre on the oat plots was about 2 bushels in 1889 and 1890; 1½ bushels in 1891 to 1893, and 2 bushels from 1894 to 1907, inclusive. The varieties used were as follows: In 1889, Early English; in 1890 to 1893, Prize Cluster; and from 1894 to 1907, inclusive, the Banner. In 1907 Banner was sown May 17, and the plots were harvested August 16.

TABLE III.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1905-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Eighteen Years.			19th Season, 1907. Variety, Banner.			Average Yield for Nineteen Years.		
		Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.	Yield of Grain.		Yield of Straw.
		Per acre.		Per acre	Per acre.		Per acre	Per acre.		Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
1	Barn-yard manure, well rotted, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. In 1905-6-7 15 tons per acre were again used.... ...	52	$11\frac{3}{18}$	3249	64	4	1560	52	$32\frac{5}{19}$	3160
2	Barn-yard manure, fresh, 15 tons per acre each year to 1898, inclusive. No manure used from 1899 to 1905. In 1905-6-7 15 tons per acre were again used................	56	$0\frac{2}{18}$	3380	51	6	2540	55	$25\frac{9}{19}$	3336
3	Unmanured from the beginning.	35	$11\frac{17}{18}$	1757	22	12	720	34	$32\frac{13}{19}$	1702
4	Mineral phosphate, untreated, finely ground, 500 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905 In 1905-6-7 fertilizer again used as in 1899	36	$31\frac{6}{18}$	1958	35	30	1300	36	$29\frac{9}{19}$	1923
5	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899....	49	$15\frac{2}{18}$	2752	34	24	2120	48	$22\frac{14}{19}$	2719
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897, inclusive. In 1898 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7 fertilizers again used as in 1898..	49	$7\frac{6}{18}$	2802	46	16	2120	49	$2\frac{8}{19}$	2766
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	49	$12\frac{9}{18}$	3135	42	3	2680	49	1	3111
8	Mineral phosphate, untreated, finely ground, 500 lbs. wood ashes, unleached, 1,500 lbs. per acre used each year from 1888 to 1897, inclusive. In 1898 and 1899, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899..	44	$19\frac{5}{18}$	2586	32	32	1230	43	$32\frac{9}{19}$	2514

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF OATS—*Concluded.*

No. of Plot.	Fertilizers applied each year, from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1899 and each year after to 1905 with the grain and ploughed under in the autumn. In 1895-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Eighteen Years. Yield of Grain. Per acre.		Average Yield for Eighteen Years. Yield of Straw. Per acre	19th Season, 1907. Variety, Banner. Yield of Grain. Per acre.		19th Season, 1907. Variety, Banner. Yield of Straw. Per acre	Average Yield for Nineteen Years. Yield of Grain. Per acre.		Average Yield for Nineteen Years. Yield of Straw. Per acre
		Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.	Bush.	lbs.	Lbs.
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899.	39	$4\frac{5}{18}$	2027	27	2	1160	38	$16\frac{15}{19}$	1981
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899.	47	$19\frac{4}{18}$	2597	40	00	1830	47	$5\frac{13}{19}$	2557
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899.	39	$6\frac{16}{18}$	2411	29	14	1280	38	$23\frac{7}{19}$	2352
12	Unmanured from the beginning	21	$0\frac{17}{18}$	1497	12	22	630	23	$14\frac{11}{19}$	1450
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 bone again used as at first	36	$4\frac{11}{18}$	1982	16	16	900	35	$3\frac{8}{19}$	1925
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers used again as at first.	41	$22\frac{9}{18}$	2316	28	28	1540	40	$23\frac{9}{19}$	2275
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer used again as at first	46	$30\frac{8}{18}$	2699	40	20	1700	46	$18\frac{10}{19}$	2647
16	Muriate of potash, 150 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	41	$0\frac{15}{18}$	2211	33	18	1220	40	$21\frac{6}{19}$	2159
17	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	46	$18\frac{17}{18}$	2757	48	28	2360	46	23	2736
18	Sulphate of iron, 60 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	39	$31\frac{9}{18}$	2055	41	6	1560	39	$33\frac{13}{19}$	2029
19	Common salt (Sodium chloride), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer used again as at first	40	$5\frac{15}{18}$	2029	40	20	1680	40	$6\frac{11}{19}$	2011
20	Land plaster or gypsum (Calcium sulphate), 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	36	$27\frac{2}{18}$	2075	31	26	1090	36	$18\frac{2}{19}$	2023
21	Mineral superphosphate, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	37	$27\frac{5}{18}$	1938	31	6	1100	37	$15\frac{7}{19}$	1894

The one-tenth acre plots of wheat, barley and oats had by the end of 1903 become infested with several troublesome perennial weeds, hence it was thought best to sow only one-half of each plot with grain in 1904, devoting the other half to a hoed crop to clean the land. On this account no clover was sown on any of the cereal plots in 1904, and one-half of the wheat plots was sown with mangels, one-half of the barley plots with potatoes, and one-half of the oat plots with carrots, computing the yields of grain from a one-twentieth acre plot in each case. Similar hoed crops were sown in 1905, 1906 and 1907, changing the position of the varieties from year to year.

INDIAN CORN PLOTS.

The experiments with the plots of Indian corn have been conducted with the object of obtaining the largest weight of well matured green fodder for the silo, and to have the corn so far advanced when cut, that the ears shall be as far as is practicable in the late milk or glazed condition. Each plot has been divided from the outset into two equal parts, on one of which—known as No. 1—one of the stronger growing and somewhat later ripening sorts has been tried, and on the other, marked No. 2, one of the earlier maturing varieties. During the first four years one of the Dent varieties was tested under No. 1. On the other half of the plot (No. 2) one of the Flint varieties was grown. For the first four years the No. 1 series was planted in drills 3 feet apart, using about 24 pounds of seed to the acre and thinning the plants, when up, to 6 or 8 inches apart, and the No. 2 in hills 3 feet apart each way with 4 or 5 kernels in a hill. During the past ten years both sorts have been grown in hills.

In 1900 no crop of Indian corn was grown on these plots, but red clover was sown in its place on May 5, in the proportion of 12 pounds per acre. This made a strong growth, was cut twice during the season and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until May 20, 1901. It was then ploughed under about 6 inches deep, and harrowed well before the corn was planted. Clover was sown again in 1903, and ploughed under in May, 1904. Corn was planted in 1905, 1906 and 1907. In 1907 it was planted on June 5, and cut for ensilage September 25.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN, CUT GREEN FOR ENSILAGE.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Fifteen Years.				16th Season, 1907.				Average Yield for Sixteen Years.			
		Plot No. 1—weight of green fodder.		Plot No. 2—weight of green fodder.		Plot No. 1—Selected Leaming, weight of green fodder.		Plot No. 2—Longfellow, weight of green fodder.		Plot No. 1—weight of green fodder.		Plot No. 2—weight of green fodder.	
		Per acre.		Per acre		Per acre.		Per acre		Per acre.		Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
1	Barn-yard manure (mixed horse and cow manure) well rotted, 12 tons per acre, each year from 1888 to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7 manure was again used as at first.	16	750	13	320	12	1110	10	1940	16	272	13	46
2	Barn-yard manure (mixed horse and cow manure) fresh, 12 tons per acre each year from 1888 to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7 manure was again used as at first........	15	1145	11	1662	10	1980	9	1960	15	572	11	1431
3	Unmanured from the beginning...........	6	1684	5	689	1	560	1	220	6	989	5	160

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN.

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Fifteen Years. ½ Plot No. 1—weight of green fodder.	Average Yield for Fifteen Years. ½ Plot No. 2—weight of green fodder.	16th Season, 1907. ½ Plot No. 1—Selected Leaming, weight of green fodder.	16th Season, 1907. ½ Plot No. 2—Longfellow, weight of green fodder.	Average Yield for Sixteen Years. ½ Plot No. 1—weight of green fodder.	Average Yield for Sixteen Years. ½ Plot No. 2—weight of green fodder.
		Per acre.	Per acre	Per acre.	Per acre	Per acre.	Per acre
		Tons. lbs.	Tons. lbs	Tons. lbs.	Tons. lbs	Tons. lbs.	Tons. lbs
4	Mineral phosphate, untreated, finely ground, 800 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 a similar weight of the Thomas phosphate was used. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899	8 755	5 1674	3 740	2 1880	8 129	5 1312
5	Mineral phosphate, untreated, finely ground, 800 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 800 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	11 1540	9 999	5 20	4 780	11 695	9 348
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground, 500 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1888 to 1897 inclusive. In 1898, 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7 fertilizers again used as in 1898	15 1975	12 223	11 1180	10 260	15 1425	11 1975
7	Mineral phosphate, untreated, finely ground, 500 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899, 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	14 1841	11 598	10 1260	9 580	14 1305	11 347
8	Mineral phosphate, untreated, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1897 inclusive. In 1898 and 1899 500 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	12 631	9 1605	8 420	7 340	12 118	9 1276
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899	11 791	8 1607	5 1080	4 1660	11 59	8 111
10	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	13 464	10 836	5 200	4 900	12 1448	10 90
11	Mineral superphosphate, No. 1, 350 lbs., nitrate of soda, 200 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	15 1979	12 808	9 1580	8 1160	15 1204	12 330

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF INDIAN CORN—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1888 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the corn and ploughed under in May, 1901, before the corn was planted. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-6-7 fertilizers again applied as in 1898. Clover discontinued.	Average Yield for Fifteen Years.				16th Season, 1907.				Average Yield for Sixteen Years.			
		½ Plot No. 1—weight of green fodder. Per acre.		½ Plot No. 2—weight of green fodder. Per acre		½ Plot No. 1—Selected Leaming, weight of green fodder. Per acre.		½ Plot No. 2—Longfellow, weight of green fodder. Per acre		½ Plot No. 1—weight of green fodder. Per acre.		½ Plot No. 2—weight of green fodder. Per acre	
		Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs	Tons.	lbs.	Tons	lbs
12	Unmanured from the beginning	10	1755	9	55	4	900	3	1780	10	952	8	1413
13	Bone, finely ground, 500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 bone again used as at first	12	367	9	1158	4	440	3	1380	11	1372	9	422
14	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first.	12	1933	10	416	8	800	7	680	12	1362	10	58
15	Nitrate of soda, 200 lbs. per acre, used each year from 1888 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	12	541	9	1185	5	760	4	1400	11	1680	9	573
16	Sulphate of ammonia, 300 lbs. per acre, used each year from 1888 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	12	1554	10	49	5	1160	4	1760	12	654	9	1406
17	Mineral superphosphate, No. 1, 600 lbs., muriate of potash, 200 lbs., sulphate of ammonia, 150 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first.	13	1002	10	464	8	1780	7	1540	13	426	10	156
18	Muriate of potash, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	10	718	7	1736	6	360	5	800	10	258	7	1428
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890, (muriate of potash, 200 lbs., substituted, each year since), dried blood, 300 lbs., mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first	12	1213	9	925	7	1160	6	1260	12	585	9	571
20	Wood ashes unleached, 1,900 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first	11	544	8	1681	6	1920	6	160	11	5	8	1336
21	Bone, finely ground, 500 lbs., sulphate of ammonia, 200 lbs., muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first	12	1058	8	345	6	1580	5	1860	12	341	8	64

PLOTS OF MANGELS AND TURNIPS.

In conducting these experiments, the roots only have been taken from the land, the tops have always been cut off and left on the ground to be ploughed under, so that the plant food they have taken from the soil has been returned to it. One half of each one-tenth acre plot in the series has been devoted to the growth of mangels, and the other half to turnips, and these crops have been alternated from year to year. The

preparation of the land has been the same for both these roots. Until 1900 it was ploughed in the autumn after the crop was gathered, gang-ploughed deeply in the spring after the barn-yard manure had been spread on plots 1, 2 and 6, and after gang-ploughing, the other fertilizers were spread by scattering them evenly over the surface, after which it was all harrowed with the smoothing harrow, then made in ridges 2 feet apart, rolled and sown.

The variety of mangel principally grown was the Mammoth Long Red, and about four pounds of seed were sown per acre each year.

The variety of turnip chiefly sown was the Prize Purple Top Swede. The land used for the turnips, which are usually sown later than the mangels, was prepared in the same manner as for the mangels. It was then allowed to stand until the day before sowing, when it was gang-ploughed shallow or cultivated to kill weeds and loosen the soil, ridged, rolled and sown. About 3 pounds of seed were sown per acre.

In 1900 and 1903, no crops of mangels or turnips were grown but clover was sown in their place in May in the proportion of 12 pounds per acre. This made a strong growth and was cut twice each year during the season, and left on the ground to decay, so that when ploughed under, the land might get the full benefit of the clover crop. The clover was allowed to remain growing until near the middle of May, the year following, by which time it had made a very heavy growth. It was then ploughed under about 6 inches deep and harrowed well, then made into ridges 2 feet apart. These were rolled with a hand roller, which flattened the ridges considerably and made a firm, even seed bed. The crops of clover and roots were alternated in this way, for the purpose of supplying humus and also of gaining information as to the fertilizing effect of green clover ploughed under on land to be used for growing roots.

From 1904 to 1907, inclusive, the roots were grown each year. In 1907 the mangels were sown on May 13, and pulled on October 18; the turnips were sown May 14, and pulled October 25. The yield per acre has been calculated in each case from the weight of roots gathered from the whole plot.

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS.

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-6-7 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Fifteen Years.				16th Season, 1907. Varieties.				Average Yield for Sixteen Years.			
						East Half Plot.		West Half Plot.					
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		Turnips: Purple Top, Swede. Weight of Roots.		Mangels Mammoth Long Red. Weight of Roots.		Mangels, Weight of Roots.		Turnips, Weight of Roots.	
		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
1	Barn-yard manure (mixed horse and cow manure) well rotted, 20 tons per acre each year from 1889 to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7 manure was again used as at first......	22	313	15	813	7	1380	14	660	21	1334	14	1848
2	Barn-yard manure (mixed horse and cow manure) fresh, 20 tons per acre each year from 1889 to 1898 inclusive. No manure used from 1899 to 1905. In 1905-6-7 manure was again used as at first............	21	497	15	803	9	1800	15	780	20	1765	15	115
3	Unmanured from the beginning.....	8	1923	7	562	3	-	3	1740	8	1224	7	27
4	Mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, used each year from 1889 to 1897, inclusive. In 1898 and 1899 a similar weight of the Thomas' phosphate was used. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899...........	8	1686	8	350	3	610	4	1000	8	1143	7	1741

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS—*Continued.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-6-7 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Fifteen Years.				16th Season, 1907, Varieties.				Average Yield for Sixteen Years.			
		Mangels, Weight of Roots.		Turnips, Weight of Roots.		East Half Plot. Turnips: Purple Top Swede Weight of Roots.		West Half Plot. Mangels: Mammoth Long Red. Weight of Roots.		Mangels. Weight of Roots.		Turnips. Weight of Roots.	
		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.		Per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
5	Mineral phosphate, untreated, finely ground, 1,000 lbs., nitrate of soda, 250 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 897 inclusive. In 1898 and 1899 500 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899....	15	238	10	400	2	1740	11	720	14	1768	9	1484
6	Barn-yard manure, partly rotted and actively fermenting, 6 tons per acre, mineral phosphate, untreated, finely ground, 1,000 lbs. per acre, composted together, intimately mixed and allowed to heat for several days before using, applied each year from 1889 to 1897 inclusive. In 1898 1,000 lbs. of Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1899 to 1905. In 1905-6-7 fertilizers again used as in 1898....	17	1666	12	1175	5	1420	11	1040	17	877	12	315
7	Mineral phosphate, untreated, finely ground, 1,000 lbs., sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years), nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1897 inclusive. In 1898 and 1899 1,000 lbs. of the Thomas' phosphate were used in place of the mineral phosphate. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899......	12	1300	9	965	6	800	11	1900	12	1212	9	580
8	Mineral superphosphate, No. 1, 500 lbs., sulphate of potash, 200 lbs. in 1889 and 1890 (substituted by muriate of potash, 250 lbs. in 1891 and subsequent years), nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as in 1899	14	578	11	979	8	1660	9	560	13	1952	11	647
9	Mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as in 1899..........................	9	1996	9	467	6	840	3	1380	9	1208	9	115
10	Nitrate of soda, 300 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer used again as in 1899.............	11	427	9	631	6	1220	8	1220	13	1725	9	293
11	Sulphate of ammonia, 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer used again as in 1899.......	12	629	10	1125	9	440	6	1220	11	1916	10	957

EXPERIMENTS WITH FERTILIZERS ON PLOTS OF MANGELS AND TURNIPS—*Concluded.*

No. of Plot.	Fertilizers applied each year from 1889 to 1898 or 1899. No fertilizers used from that time to 1905. Clover sown in 1900 in place of the roots and ploughed under in May, 1901, before the roots were sown. In 1903 clover was again sown and ploughed under in May, 1904. In 1905-6-7 fertilizers again applied as in 1899. Clover discontinued.	Average Yield for Fifteen Years. Mangels, Weight of Roots. Per acre.		Average Yield for Fifteen Years. Turnips, Weight of Roots. Per acre.		16th Season, 1907, Varieties. East Half Plot. Turnips: Purple Top Swede Weight of Roots. Per acre.		16th Season, 1907, Varieties. West Half Plot. Mangels: Mammoth Long Red. Weight of Roots. Per acre.		Average Yield for Sixteen Years. Mangels, Weight. of Roots. Per acre.		Average Yield for Sixteen Years. Turnips, Weight of Roots. Per acre.	
		Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.	Tons.	lbs.
12	Unmanured from the beginning.....	7	859	7	343	4	380	2	1540	7	277	6	1973
13	Bone, finely ground, 500 lbs., wood ashes, unleached, 1,000 lbs. per acre, used each year from 1889 to 1899 inclusive No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first.......	12	946	8	1739	6	1120	8	40	12	389	8	1450
14	Wood ashes, unleached, 2,000 lbs. per acre, used each year from 1889 to 1899, inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first.....	11	659	8	656	4	640	6	1860	11	109	8	155
15	Common salt (Sodium chloride), 400 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first....	10	174	7	1558	2	1040	3	1520	9	1383	7	901
16	Mineral superphosphate, No. 1, 500 lbs., nitrate of soda, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilzers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first	12	1563	9	1897	6	1660	5	840	12	643	9	1507
17	Mineral superphosphate, No. 1, 350 lbs., wood ashes, unleached, 1,500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first...........................	13	699	10	966	8	1160	6	340	12	1802	10	728
18	Mineral superphosphate, No. 1, 500 lbs., muriate of potash, 200 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first....	13	504	10	1943	7	1240	9	160	12	1983	10	1524
19	Double sulphate of potash and magnesia, 300 lbs. per acre in 1889 and 1890 (muriate of potash, 200 lbs., substituted each year since), dried blood, 250 lbs., mineral superphosphate, No. 1, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first............	14	989	11	1610	7	1880	8	1960	14	300	11	1127
20	Wood ashes, unleached, 1,500 lbs. common salt (Sodium chloride), 300 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizers used from 1900 to 1905. In 1905-6-7 fertilizers again used as at first.........................	15	510	10	1290	4	980	11	220	14	1992	10	521
21	Mineral superphosphate, No. 2, 500 lbs. per acre, used each year from 1889 to 1899 inclusive. No fertilizer used from 1900 to 1905. In 1905-6-7 fertilizer again used as at first..	14	1524	10	1680	6	1020	6	1900	14	547	10	1140

The season of 1907 was a singularly unfavourable one for the trial plots with fertilizers. The weather was cool and backward for some months. In the wheat plots there was a considerable falling off in yield of grain even in those plots treated with barnyard manure. The unfertilized plots gave less than half the average crop of past years, while other plots fell more than a third below the average. The yields of straw were also very small.

The yield of grain in the barley plots averaged much better than the wheat; indeed seven of the twenty-one plots gave crops above the average. Plot 19, dressed with 300 pounds of common salt annually, continues to give a high yield; this year it was more than four bushels above the average for the past eighteen years. The unfertilized plots were notably low in yield of grain, and the weight of straw in each case was much below the average.

In the oat plots only four out of the twenty-one were above the average of past seasons. The unfertilized plots were very low in yield of grain, while in no case did the weight of straw reach the average of the past eighteen years, while in five of the plots the weight of straw fell below half an average crop.

The weight of fodder cut from the plots of Indian corn grown for ensilage was very small; the cold and wet season was very unfavourable for this crop. Plots 1, 2 and 6, which were fertilized with barnyard manure, were the only ones which reached two-thirds of an average crop; nine of the twenty-one plots gave less than half of an average yield.

The field roots also gave poor returns. In the mangels seven of the plots gave less than half the average for the past fifteen years, and all of the remaining plots fell more or less below the average. The turnips also gave inferior crops, which were further reduced by a disease which affected the roots and caused many of them to rot. Five of the plots gave less than half of an average return, and none of the plots were quite up to the average.

BULLETINS ISSUED DURING THE YEAR ENDING MARCH 31, 1908.

Four bulletins were issued this year, and a second edition of several others the stock of which had become exhausted. The new bulletins were the following:—

No. 56, on Bush Fruits, with lists of varieties found most useful. This bulletin was prepared by Mr. W. T. Macoun, Horticulturist of the Central Experimental Farm.

The cultivation of small fruits has of late engaged the attention of a large number of fruit-growers and farmers in the different provinces of Canada, many of whom have found in this occupation a considerable source of profit. The fact that many of these useful fruits can be successfully grown in every settled district in the Dominion makes it important that practical information regarding the most improved methods of cultivation and the most profitable varieties to grow should be widely disseminated.

The information submitted by the Horticulturist in this bulletin, contains the conclusions reached by him after long experience, and embodies the results of the tests and observations which have been carried on at the Central Experimental Farm for the past twenty years. By adopting the methods of cultivation, and selecting the varieties here recommended, any one so desiring can with very little labour supply his household with delicious fruit during the summer months, when such an addition to the diet is most healthful and necessary.

Bulletin 57, on Quality in Wheat.—This bulletin consists of two parts, Part I. has been prepared by the Cerealist, Dr. C. E. Saunders, and Part II. by the Chemist of the Experimental Farms, Mr. Frank T. Shutt.

In Part I. the chief subjects discussed are the breeding of new sorts of wheat of high quality, especially early ripening varieties, suitable for the northern parts of Canada and the determination of the quality of the different sorts now in cultivation with special reference to their relative value in breadmaking. The crossing and the selecting of wheats are dealt with, also the methods of milling the different sorts and

of conducting baking tests from the samples so obtained. In the baking the proportion of water taken up and retained by the several varieties is recorded. Accurate measurements have been obtained of the volume of the loaves of bread made and the texture, colour and other peculiarities of each sample noted. A method has been devised for estimating the baking strength of each flour from a baker's standpoint, and the relative value of the different flours for the making of bread ascertained. These tests include spring wheats, winter wheats, durum wheats, also several commercial flours, the latter being introduced for comparison. The relative points of merit also the deficiencies found in the different sorts are fully discussed, and the value of mixed flours in breadmaking considered. The results here presented of the research work carried on by the Cerealist in this important line of investigation are highly interesting, and the methods devised for solving some of the difficult problems encountered are ingenious and original.

In Part II. the chemical aspects of this work are presented, the chemical composition of wheats is discussed and the value of their different characteristics referred to. Most of the samples which have been milled and baked by the Cerealist have been submitted to analysis by the Chemist and much information is thus given as to their composition. The important part played by the nitrogen compounds in the making of bread is also dwelt on, and the total percentages of albuminoids in each sample given, also the proportions of gliadin, sugar and ash found in each case. This bulletin is most instructive and will commend itself to those who desire information on this important subject.

Bulletin 58.—During the past thirteen years experiments have been conducted on uniform trial plots at each of the older Dominion Experimental Farms for the purpose of gaining information as to the most productive and earliest ripening varieties of grain, fodder corn, field roots and potatoes. This bulletin is the thirteenth which has been published on this subject. It has been prepared jointly by the Cerealist, Dr. C. E. Saunders, and myself. There are presented in this issue the results of a large number of experiments which have been conducted at the experimental farms during the season of 1907 with spring wheat, durum or macaroni wheat, emmer and spelt, oats, barley, peas, Indian corn, turnips, mangels, carrots, sugar beets and potatoes. The average results are also given of these comparative tests for the past five years of those varieties which have been long under trial and these records are arranged in the order of their yield.

These trial plots show much variation in the weight of the crops grown and point to the importance of care in the choice of varieties of seed for sowing.

Bulletin 59, on the Flax Plant and its Cultivation for Seed and Fibre.—This bulletin was prepared by myself. In it the subject of flax is discussed, its cultivation for seed and fibre, and information given as to the preparation of the land, the best time for sowing, the quantity of seed to sow, and the general treatment of the crop.

In view of the growing importance of the flax crop in Canada, it seems desirable that our farmers should be placed in possession of such facts as may be helpful to them in this branch of agricultural industry.

Bulletin No. 4, second series, on Alkali Soils, their Nature and Reclamation.—This bulletin was prepared by the Chemist of the Experimental Farms, Mr. Frank T. Shutt. In this publication the origin of the different sorts of alkali soils is discussed, also their composition and characteristics, and methods of treatment are suggested whereby the alkali in such soils may be lessened or removed. The information contained in this bulletin will no doubt be very useful to farmers living in those parts of the great Northwest plains and British Columbia wheer alkali is occasionally found.

Bulletins of the second series treat of such subjects as are of interest to a limited class of readers and are mailed only to those parts of the Dominion where the information is likely to be useful. Copies may, however, be obtained by any one desiring them as long as the edition lasts, by application to the Director of the Experimental Farms, Ottawa.

Two circulars have also been issued during the year, giving useful information. One of these was prepared by the Cerealist, Dr. C. E. Saunders, on 'Preston and other early-ripening wheats.' In it particulars were given as to the earliness, stiffness and length of straw, yield, appearance of grain, grade, and selling price of the different varieties. The milling value colour of flour and baking strength in each case were also dwelt on. This circular was issued in March, so that farmers might be in possession of this timely information before the period arrived for seeding.

The other circular was prepared by Mr. W. H. Fairfield, Superintendent of the Experimental Farm for Southern Alberta, at Lethbridge, on the subject of 'Alfalfa.' The importance of this valuable fodder crop to farmers in the drier districts of the Canadian Northwest can scarcely be over-estimated, and any information, especially if gained by experience, is most acceptable. Mr. Fairfield gives the results of his own trials on his farm near Lethbridge, and discusses the following topics: Raising alfalfa with and without irrigation; soil and its preparation, inoculation; seed, quantity per acre, date of seeding, treatment the first season, curing the hay, raising seed, late fall irrigation discing and life of an alfalfa field.

Both these circulars have been widely distributed, and copies may still be had on application by any one desiring them.

TESTS OF THE VITALITY OF SEED GRAIN AND OTHER SEEDS.

The following report includes tests of grain and other seeds grown on the several experimental farms, as well as those bought with the object of growing them on the farms. The list also includes tests of the vitality of a number of specimens of grain grown in the several provinces of the Dominion from the samples distributed from the Central Experimental Farm. These tests have been made with the object of ascertaining what climatic conditions are most favourable for producing seed of high vitality, and how far this desirable quality is likely to be influenced by variations in character of season. Formerly these tests included a number of doubtful samples which were believed by the parties sending them to have been injured in their vitality by exposure to unfavourable conditions. All such samples are now referred to the Seed Commissioner for report. The results reported on here are the average proportions of vitality shown by samples of grain grown in different parts of the several provinces of Canada under healthy and normal circumstances. In the following table, showing the results by provinces, the total percentage of vitality is given, also the percentage of strong and weak growth.

RESULTS OF TESTS OF SEEDS FOR VITALITY, 1906-7.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Per centage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Wheat	466	100·0	25·0	82·7	4·8	87·6
Barley	344	100·0	37·0	82·4	9·4	91·8
Oats	467	100·0	10·0	91·6	3·5	95·2
Rye	12	96·0	68·0	76·3	5·0	81·4
Peas	201	100·0	24·0	....	....	92·0
Corn	18	96·0	68·0	....	....	83·1
Flax	16	98·0	72·0	....	....	87·6
Beans	4	100·0	78·0	....	....	92·5
Tares	2	93·0	81·0	....	....	87·0
Clover	3	95·0	80·0	....	....	89·0
Grass	1	84·0	84·0	....	....	84·0
Total number of samples tested, highest and lowest percentage	1,534	100·0	10·0	....	....	....

Signed, WILLIAM T. ELLIS.

TABLE SHOWING RESULTS OF GRAIN TESTS FOR EACH PROVINCE.

Kind of Seed.	Number of Tests.	Highest Percentage.	Lowest Percentage.	Percentage of Strong Growth.	Percentage of Weak Growth.	Average Vitality.
Ontario.						
Wheat	147	100·0	25·0	68·0	8·0	76·0
Barley	104	100·0	37·0	77·6	10·8	88·4
Oats	115	100·0	69·0	92·8	3·2	96·0
Quebec.						
Wheat	28	100·0	71·0	92·5	2·1	94·7
Barley	26	100·0	70·0	91·0	3·6	94·6
Oats	27	100·0	79·0	93·5	3·2	96·8
Manitoba.						
Wheat	59	100·0	54·0	83·2	5·5	88·8
Barley	41	100·0	72·0	79·3	10·8	90·2
Oats	71	100·0	84·0	91·7	3·6	95·4
Saskatchewan.						
Wheat	89	100·0	72·0	90·0	2·7	92·7
Barley	62	100·0	51·0	91·1	3·4	94·5
Oats	72	100·0	83·0	93·4	2·6	96·0
Alberta.						
Wheat	37	100·0	82·0	93·6	2·3	96·0
Barley	12	100·0	89·0	94·1	3·5	97·6
Oats	20	100·0	10·0	81·2	3·4	84·6
Nova Scotia.						
Wheat	47	98·0	65·0	86·7	4·6	91·4
Barley	53	100·0	56·0	75·6	16·3	92·0
Oats	61	100·0	59·0	92·3	3·8	96·1
New Brunswick.						
Wheat	25	100·0	73·0	92·4	2·2	94·6
Barley	8	100·0	82·0	93·6	2·5	96·1
Oats	26	100·0	83·0	94·9	2·3	97·2
Prince Edward Island.						
Wheat	20	100·0	88·0	93·6	3·3	96·9
Barley	3	99·0	95·0	88·0	8·3	96·3
Oats	25	100·0	92·0	93·6	3·6	97·3
British Columbia.						
Wheat	14	100·0	89·0	92·8	2·6	95·5
Barley	35	100·0	45·0	82·1	11·5	93·7
Oats	50	100·0	68·0	85·8	5·8	91·7

Signed, WILLIAM T. ELLIS.

METEOROLOGICAL OBSERVATIONS.

TABLE OF METEOROLOGICAL OBSERVATIONS TAKEN AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA; MAXIMUM, MINIMUM, AND MEAN TEMPERATURE FOR EACH MONTH, WITH DATE OF OCCURRENCE; ALSO, RAINFALL, SNOWFALL, AND TOTAL PRECIPITATION.

Omitted from Report of 1906–1907.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 Hours.	Date.
1907	°	°	°	°	°		°							
Jan.	18·15	0·02	18·18	9·11	44·8	20th	—23·2	17th	0·72	12·50	1·97	18	0·48	4th
Feb.	17·94	4·06	21·93	6·90	35·5	2nd	—23·0	23rd	T	17·25	1·72	17	0·35	19th
Mar	35·67	16·53	19·14	26·10	51·8	28th	—19·0	1st	1·55	11·50	2·69	16	1·00	24th
									2·27	41·25	6·37	51		

1907–1908.

Month.	Maximum.	Minimum.	Range.	Mean.	Highest.	Date.	Lowest.	Date.	Rainfall.	Snowfall.	Total Precipitation.	Number of days Precipitation.	Heaviest in 24 Hours.	Date.
April ...	45·77	27·09	18·67	36·42	67·8	29th	11·0	6th	2·59	7·25	3·31	11	1·72	30th
May.. ..	59·98	36·34	23·64	48·16	86·8	15th	19·3	5th	1·56	7·50	2·31	11	1·30	4th
June....	77·91	52·34	25·57	65·12	95·8	18th	40·7	12th	2·20	......	2·20	10	0·86	19th
July ...	79·34	55·42	23·91	67·37	87·0	17th	44·5	3rd	3·73	.....	3·73	16	0·85	8th
Aug	77·10	49·01	28·08	63·05	93·3	11th	39·0	19th	1·13	....	1·13	11	0·35	24th
Sept	67·44	48·28	19·16	57·86	84·4	15th	30·0	26th	3·32	....	3·32	17	1·81	29th
Oct..	51·44	31·58	19·85	41·50	66·0	4th & 17th	18·0	31st	2·66	1·00	2·80	15	0·62	8th
Nov.....	38·62	25·03	13·59	31·82	53·8	1st	8·2	29th	3·37	5·50	3·92	15	1·93	7th
Dec.....	29·07	16·53	12·53	22·79	45·5	10th	—7·0	5th	0·81	34·75	4·27	17	1·02	30th
Jan.	21·27	—1·01	22·29	10·13	39·5	22nd	—28·8	30th	0·13	30·25	3·15	19	0·70	27th
Feb	19·50	—0·31	19·81	9·59	39·0	14th	—30·8	5th	0·96	35·25	4·48	13	1·40	26th
Mar.. ..	32·08	13·75	18·33	22·91	43·0	26th	—10·0	10th	2·24	13·25	3·56	18	1·13	15th
									24·70	134·75	38·18	173		

In calculating the total precipitation 10 in. of snow is equal to 1 in. of rainfall.

Rain or snow fell on 173 days in the 12 months.

Heaviest rainfall in 24 hours, 1·93 inches on November 7th.

Heaviest snowfall in 24 hours, 14·00 inches on February 26th.

The highest temperature during the 12 months was 95·8° on June 18th.

The lowest temperature during the 12 months was —30·8° on February 5th.

During the growing season rain fell on 11 days in April, 11 days in May, 10 days in June, 16 days in July, 11 days in August, and 17 days in September.

June shows the lowest number of days with precipitation, viz., 10.

Total precipitation during the 12 months, 38·18 inches, as compared with 28·94 inches during 1906–07.

RAINFALL, SNOWFALL, AND TOTAL PRECIPITATION FROM 1890 to 1907-08, ALSO THE AVERAGE ANNUAL AMOUNT THAT HAS FALLEN.

Year.	Rainfall.	Snowfall.	Total Precipitation.
1890	24·73	64·85	31·22
1891	30·19	73·50	37·54
1892	23·78	105·00	34·28
1893	31·79	72·50	39·04
1894	23·05	71·50	30·20
1895	27·01	87·50	35·76
1896	21·53	99·75	31·50
1897	24·18	89·00	33·08
1898	24·75	112·25	35·97
1899	33·86	77·25	41·63
1900	29·48	108·00	40·72
1901	29·21	97·25	38·91
1902	25·94	101·75	36·10
1903	26·43	85·00	34·92
1904	25·95	108·75	36·79
1905	23·71	87·25	32·42
1906, January 1 to March 31	1·90	24·50	4·34
1906-07	21·73	72·50	28·94
1907-08	24·70	134·75	38·18
Total for 18 years and 3 months	473·92	1672·85	641·54
Yearly average for 18 years	26·22	91·58	35·40

The 3 months from January 1 to March 31, 1906, are omitted in calculating the yearly average.

RECORD OF SUNSHINE AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, FROM JANUARY 1, 1907 TO MARCH 31, 1908.

Months.	Number of days with Sunshine.	Number of days without Sunshine.	Total hours Sunshine.	Average Sunshine per day.
	1907.			
January	16	15	66·5	2·14
February	20	8	116·2	4·15
March	25	6	149·5	4·82
	1907-08.			
April	25	5	175·8	5·86
May	30	1	207·1	6·68
June	28	2	205·2	6·84
July	29	2	235·7	7·60
August	31	0	242·3	7·81
September	21	9	121·6	4·05
October	27	4	136·3	4·39
November	18	12	65·3	2·17
December	14	17	48·9	1·57
January	23	8	101·0	3·25
February	22	7	128·7	4·43
March	22	9	99·5	3·20

Signed, WILLIAM T. ELLIS,
Observer.

CORRESPONDENCE.

The correspondence carried on during 1907 between the farmers of Canada and the officers of the Experimental Farms has been very large.

CENTRAL EXPERIMENTAL FARM.

The following is a summary of the letters received and sent out at the Central Experimental Farm from April 1, 1907, to March 31, 1908:—

	Letters received.	Letters sent.
Director	53,737	25,558
Agriculturist	2,980	3,750
Horticulturist	2,084	1,866
Chemist	1,785	1,557
Entomologist and Botanist	4,030	3,640
Cerealist	357	317
Poultry manager	3,924	3,730
Accountant	1,406	2,024
Total	70,303	42,442

Many of the letters received by the Director are applications for samples of grain, or for the publications issued by the Experimental farms, many of these are answered by mailing the material asked for accompanied in most instances by circular letters. This will explain why the number of letters received by that officer so much exceeds the number sent out.

DISTRIBUTION OF REPORTS, BULLETINS AND CIRCULAR LETTERS.

Reports and bulletins mailed	250,089
Circular letters relating to samples of seed grain	49,175
Total	299,264

Branch Experimental Farms.

The correspondence conducted by the Superintendents of the branch experimental farms is also large, as is shown by the following figures:—

	Letters received.	Letters sent.
Experimental Farm, Nappan, N.S.	2,650	2,625
" Brandon, Man.	3,931	3,263
" Indian Head, Sask.	8,120	8,082
" Agassiz, B.C.	4,015	3,809
	18,716	17,779

Much additional information has also been sent out from the branch farms in printed circulars. By adding the correspondence conducted at the branch farms to that of the Central Farm, the total number of letters received is found to be 89,019, while those sent out number 60,221.

VISITS TO THE BRANCH EXPERIMENTAL FARMS.

Visits were paid to the branch experimental farms in the west during May, June and July, and the farm for the maritime provinces was visited in September.

EXPERIMENTAL FARM, BRANDON, MAN.

Arriving at Brandon on May 27, I found everything on the experimental farm in good order. The general condition of the buildings, crops, stock, implements, &c., were all satisfactory. Notwithstanding the unfavourable weather and lateness in seeding, the crops were coming up and soon covered the ground. At the time of the later visit from 6th to 8th July, the growth was much advanced and subsequently the harvest proved fairly satisfactory. The trial plots of the fourteen varieties of wheat gave an average of 38 bushels 8 lbs. per acre; the thirty-one varieties of oats produced an average of 114 bushels 24 lbs. per acre. The fifteen varieties of six-rowed barley gave 64 bushels 1 lb. per acre, and the thirteen varieties of two-rowed barley 63 bushels 17 lbs. per acre. Indian corn and field roots gave about an average crop, and potatoes a yield above the average.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.

Indian Head was visited on the 29th and 30th of May and again on the 4th and 5th of July. At the first visit it was quite evident that the crops were much later than usual, as the grain at that time barely covered the ground. The superintendent had made the best use of every opportunity which had offered to get the seed in the ground as promptly as possible, yet the crops were about three weeks later than usual. The land had been well prepared and all the crops were looking healthy, and were growing rapidly. When seen on the second visit in July they were vigorous, but still late and were not matured when overtaken by frost September 12, when many of the varieties suffered considerable injury.

The uniform trial plots yielded as follows: Fourteen varieties of spring wheat gave an average of 19 bushels 7 lbs. per acre; thirty-one varieties of oats, 110 bushels 20 lbs. per acre; fifteen sorts of six-rowed barley, 60 bushels 9 lbs., and thirteen varieties of two-rowed barley gave an average of 53 bushels 7 lbs. per acre.

At both my visits I found the buildings, stock, implements, &c., in good order, everything betokening careful supervision.

EXPERIMENTAL FARM, LETHBRIDGE, ALBERTA.

This new farm was visited on June 2-5 and again on the 1st and 2nd of July. The fencing of the farm was well advanaced, the barn and stable nearly ready for occupation, a cottage for the workmen in course of erection, and a house for the superintendent planned. These were all completed and occupied before the close of the fiscal year. A small field of three or four acres had been worked up in the spring, and in this was planted a large collection of fruits and vines; also a number of varieties of ornamental shrubs and trees which were sent up in the spring from Ottawa. Most of these were doing well. A comprehensive system of tree-planting was planned, which, however, will take several years to complete. Before the close of the season 155 acres of land were broken, a considerable area was sown to winter wheat, and a sufficient portion left available for spring sowing.

EXPERIMENTAL FARM, LACOMBE, CENTRAL ALBERTA.

At Lacombe, which was visited on June 7 and 8, and again on the 28th and 29th, much progress was made. Locations were chosen for the buildings during the early visit, contracts made, and by the end of June considerable progress was made on the barn and stable; a cottage for the workmen was also begun, while the Superintendent's dwelling was erected later. Sufficient grain was sent up of most of the varieties under

trial, to begin a regular course of experiments to find out those varieties best fitted for growth in that locality. A large area on this farm was devoted to oats.

A considerable collection of fruit, forest and ornamental trees, shrubs and plants were sent from Ottawa, and these were planted in a very suitable piece of soil well worked up, where they made good growth. The experimental plots of grain, &c., made strong growth, and presented a very attractive appearance. The spring season was very cold and backward, and early autumn frosts occurred sooner than usual and before the varieties were fully matured. Notwithstanding the unfavourable season the fourteen varieties of wheat under trial gave an average of 21 bushels 51 lbs. per acre, and the thirty-one sorts of oats tested yielded on an average 86 bushels 31 lbs. per acre. The barleys and field roots also did well.

EXPERIMENTAL FARM, AGASSIZ, BRITISH COLUMBIA.

Agassiz, in British Columbia, was visited from the 11th to 14th of June, and again later in the month. The horses, cattle, sheep, pigs and poultry were all in good condition and thriving, but the season was late and cold as in the east, and none of the grain was got in until after the middle of April, hence the crops were backward. The grounds were looking beautiful. The rhododendrons, azaleas, laburnums, weigelias and deutzias were all in full bloom and very attractive. The fruits had set well and were growing rapidly, and gave good promise of fair crops. The cherries were very abundant, sweet and luscious; wet weather, however, occurred about that time, when the fruit swelled rapidly and the cherries cracked, when they became useless for shipping. The commercial orchards recently planted were making good progress and were very promising. Hot weather during June, July and the first half of August hastened the ripening of the principal crops and the results on the whole were satisfactory.

The thirty-one varieties of oats grown on the trial plots gave an average crop of 66 bushels 16 lbs. per acre; barley, Indian corn and field roots were well up to the average. Potatoes gave an excellent return; the twenty-eight varieties tested gave an average of 474 bushels 25 lbs. per acre.

EXPERIMENTAL FARM, NAPPAN, NOVA SCOTIA.

This eastern experimental farm was visited on September 2 to 4. The spring there had been also cold and wet, and seeding had been much delayed, and the earliest grain was not sown until May 20. There was good growing and ripening weather later in the season, which matured the grain crops very well and gave satisfactory returns.

The fourteen varieties of spring wheat tested gave an average yield of 28 bushels 26 lbs. per acre, the thirty-one varieties of oats 68 bushels 16 lbs. per acre; the fifteen varieties of six-rowed barley 35 bushels 24 lbs., and the thirteen varieties of two-rowed barley 42 bushels 12 lbs. per acre.

Hay gave a good crop, and it was well saved, while field roots and potatoes gave liberal returns. Apple trees gave a medium crop and most of the small fruits did well.

ACKNOWLEDGMENTS.

I thank the officers of the Central and Branch Farms for their earnest co-operation in carrying on so successfully the several divisions of the work of which they have charge. My acknowledgments are also due to those members of the staff who have assisted me in those branches of the work of which I have retained personal charge, to the farm foreman who has carefully supervised the special tests of fertilizers and recorded the results, to the foreman of the Distribution branch for his watchful care over the distribution of the samples of seed grain, to the foreman

in care of the lawns and ornamental grounds for the taste and industry he has displayed, and to the foreman of the greenhouses for his careful management of the plants and shrubs grown in the greenhouses and propagated for outside decoration; also for the useful work he has done in testing the vitality of seeds and in the taking of meteorological records. I desire also to bear testimony to the faithful services of my secretary. The employees also of all the farms have my thanks for the interest they have manifested in their work and the careful manner in which they have discharged their respective duties.

REPORT OF THE AGRICULTURIST

J. H. Grisdale, B. Agr.

Dr. William Saunders, C.M.G.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith reports upon the horses, cattle, sheep, swine and farming operations under my supervision during the past year.

I have to report a fairly successful year in connection with live stock, but the crop returns in 1907, like those in 1906, fell very considerably below the average, due largely to an exceptionally dry summer. The reports of the returns from the different fields under cultivation attached hereto indicate clearly the injurious effects of the dry weather upon the roots and grain crops. The hay crops here were fairly good, due to the good start in the spring, but the second crop harvested was very small.

The work in my division was as usual carried on with the efficient co-operation of the farm foreman, Mr. D. D. Gray, and the herdsman, Mr. C. T. Brettell. Mr. Brettell was succeeded in October by Mr. Chas. S. Wood, who has been doing excellent work. Mr. J. Meilleur continues to do very satisfactory work in the dairy. To Mr. Geo. O. Morisset, my secretary, I am indebted for most painstaking and intelligent co-operation in all correspondence and clerical work in my division.

During the year I attended a number of meetings in various parts of Canada, and took part in various short courses for farmers and farmers' sons, in addition to my regular duties on the Central Experimental Farm.

From April 1, 1907, to March 31, 1908, 2,980 letters were received and 3,750 despatched by the Agricultural Division.

I have the honour to be, sir,
Your obedient servant.

J. H. GRISDALE,
Agriculturist.

LIVE STOCK.

The live stock now (April 1, 1908) occupying the different stables and pens under my charge include horses, cattle, sheep and swine.

HORSES.

The horses are kept for labour exclusively, although some experimental feeding is usually under way to gain some information as to the most economical methods of feeding work horses, as well as experiments to determine the comparative values of different foods as forage for the same.

The horses are usually 19 in number, made up of:—

Thirteen heavy work horses of Clydesdale and Percheron blood.

Five heavy driving horses.

One light driver.

CATTLE.

There are representatives of four breeds of cattle, viz.: Shorthorn, Ayrshire, Guernsey and Canadian. There are besides a number of grade cattle and steers. The cattle are kept for breeding and feeding operations, mostly of an experimental character. Pure-bred breeding animals are usually on sale, however, and a considerable number are sold in the course of the year.

PURE-BRED BREEDING CATTLE.

The pure-bred cattle in the barn at present are as follows:—

Twenty-four Shorthorns, including 6 bulls and 18 females.

Twenty Ayrshires, including 2 bulls and 16 females.

Thirteen Guernseys, including 3 bulls and 10 females.

Eighteen Canadians, including 3 bulls and 15 females.

GRADE CATTLE.

At present the grades number 20 head, made up of 1 Shorthorn grade, 4 Ayrshire grades, 7 Guernsey grades, and 8 Canadian grades.

STEERS.

Forty-three steers are under feed at present. They are of different ages and breeding, and the number is made up of:—

Twenty-four two-year-olds; 8 yearlings; 11 calves.

SHEEP.

Sheep are not kept in large numbers, only 42 being now in the pens. Two breeds are kept, namely: Shropshire and Leicester.

There are 30 Shropshires, as follows: 1 aged ram, 6 ram lambs, 11 aged ewes, 4 shearling ewes and 8 ewe lambs.

There are 12 Leicesters, as follows: 6 ewes, 3 yearling ewes and 3 ewe lambs.

SWINE.

One hundred and ninety-nine swine of all classes are now in the pens, being fed experimentally or being kept for breeding purposes. The breeds kept are Berkshires, Tamworths and Yorkshires.

The Yorkshires are 123 in number, including: 2 stock boars, 6 young boars, 35 breeding sows and 80 young pigs.

The Berkshires are 11 in number, including: 1 stock boar, 7 breeding sows.

The Tamworths are 8 in number, including: 1 stock boar, 7 breeding sows.

Fifty-seven feeders, different sizes and breeds.

HORSES.

There are usually 19 horses in the stables. These horses are expected to do the work in the various divisions during the year. The work on the '200 acre farm' is but a part of their duties. They work in addition for the horticultural and cereal divisions, as well as upon the lawns and in the arboretum. In addition a large amount of hauling in connection with the different divisions, as well as road-making and messenger service, takes up much of their time.

HORSE LABOUR.

During the year from April 1, 1907, to March 31, 1908, the work done by the 19 horses kept in the stables here was equivalent to 6,538·2 days' work, distributed as follows: Live stock, hauling feed, marketing stock, &c., 149·5 days; farm work (200 acre farm), 784·8 days; draining and care of roads, including removing snow and breaking roads in winter, 131·8 days; manure on 200 acre farm, 350·8 days; arboretum, 116·5 days; horticultural division, 665·2 days; lawns, &c, 178·8 days; cereal division, 632·0 days; bulletins and reports to and from farm office, 31·6 days; poultry, 49·0 days; mail, including milk delivery, 169·0 days; omnibus service, including 3 horses for omnibus, 2 horses for general driving and 1 horse for supervision of work, 2,569 days; work about greenhouse, outbuildings, sidewalks, exhibitions &c., 710·2 days.

In estimating the cost of farming operations further on in this report, $3 a day is charged for team and driver. To feed and care for the horses costs 32$\frac{1}{8}$ cents per horse per working day, and the driver receives an average of 1.72\frac{1}{2}$ per 10-hour day. It is evident, therefore, that the team and driver cost 2.37\frac{1}{8}$ per day, leaving a margin of 62$\frac{5}{8}$ cents, or 31$\frac{1}{2}$ cents nearly per horse per day for wear and tear.

HORSE BARN.

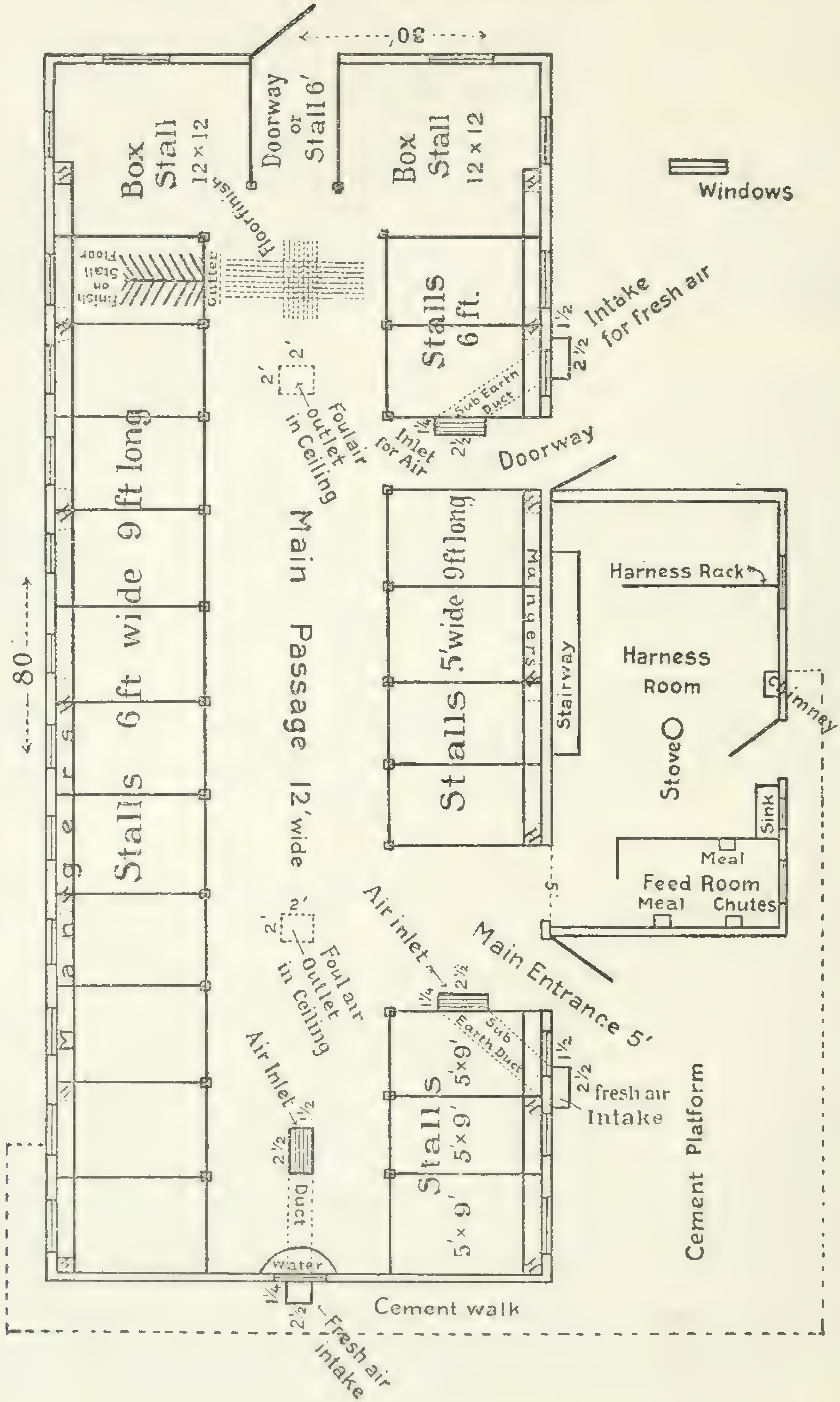
In 1906, on the Central Experimental Farm was built a horse barn capable of accommodating 23 horses. A floor plan and cross-section plan are submitted herewith. A few words of explanation follow:—

The plan of the ground floor explains itself for the most part. The doorway at the end marked 'doorway or stall' is not used as an entry or exit for horses. It is of such a size and so constructed that it may, if occasion arises, be used as a stall.

Referring to the cross-section diagram, it is intended to show the (1) wall construction, (2) floor construction and inclines, (3) feed chutes, (4) mangers, (5) King system of ventilation, (6) Rutherford system of ventilation, (7) stall divisions.

The walls starting at the outside are built: vertical inch-dressed lumber, battens overjoints, two building papers rough lumber, horizontal; 6-inch studs and air space; rough lumber, horizontal; building paper; V joint inside finish. The ceiling or upper floor is constructed similarly, joists supported by two beams resting on stall posts.

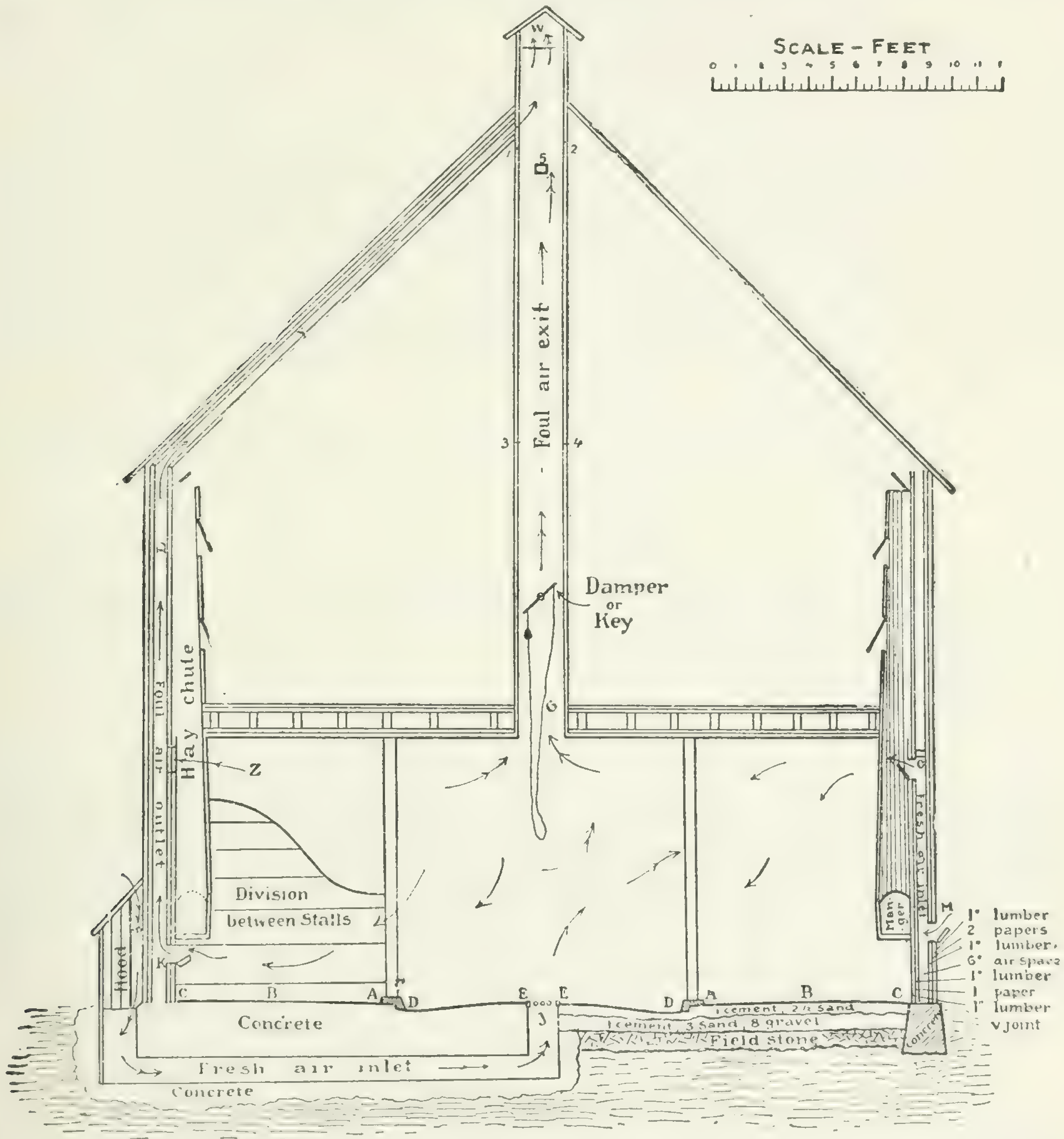
As indicated the foundation was built of concrete. The floor a regular cement one with the necessary pitches or inclines, &c., was built of rather unusual strength on account of its being for horses. A good depth of stone was laid on the ground, a layer of about five inches of rough concrete, one cement, three sand, eight gravel followed and finished off with a second layer, one part cement, two and a half parts coarse sand, and a half part crushed granite. The surface of the passages is cut by inch-deep grooves into six-inch squares. The main passage twelve feet wide, is about three


30'
Box Stall 12×12
Doorway or Stall 6'
Box Stall 12×12
Windows
Floorfinish
Finish on Stall Floor
Gutter
Stalls 6 ft.
Intake for fresh air
Sub Earth Duct
Inlet for Air
Foul air outlet in Ceiling
Doorway
Main Passage 12' wide
Stalls 6 ft wide 9 ft long
Mangers
80'
Stalls 5' wide 9 ft long
Mangers
Stairway
Harness Rack
Harness Room
Chimney
Stove
Sink
Meal
Feed Room
Meal Chutes
Main Entrance 5'
Air inlet
Foul air Outlet in Ceiling
Sub Earth Duct
fresh air Intake
Air Inlet
Stalls 5'×9' 5'×9' 5'×9'
Duct
Water
Cement Platform
Cement walk
Fresh air intake

inches higher in the centre descending with a convex slope to immediately behind the horses. The stand for the horses is about four inches higher than the gutter or lowest point of the twelve-feet passage.

The stands are nine feet long, first three feet level, and a fall of one inch in six feet at rear. Stalls vary in width from five feet to six feet one inch, the centre of the stall floor being one half inch lower than the outer edges. The horses stand on cement.

Feed chutes, as shown in diagram, begin at the plate and end in the manger. Doors to admit hay into chutes occur at top, about half way down and near the floor of loft. The chute is slightly bell-shaped so that hay once started drops to manger. This plan of feeding long hay has been found very satisfactory.



The mangers extend clear across the stall, the hay chute falling into one end. The grain or meal is fed in the manger, no special box therefor. Horses are watered by man in charge. Tank at end of twelve foot passage to which they may be led if so desired.

This stable is equipped with two distinct systems of ventilation either one of which may be operated quite independently of the other. They are what are known as (1) the King system of ventilation, (2) the Rutherford system of ventilation. In the King system the fresh air is allowed to enter at the ceiling, and leave at or near

the floor. In the Rutherford system, the air enters at or near the floor level and leaves at the ceiling.

In the diagram the course of the air currents when the King system is in operation is shown by the single-headed arrows. That is, the air enters the intake passage at 'M' on the right, ascends by 'fresh air inlet' to 'O' where it enters the stable. The air then circulates, is befouled or mixed with the carbon dioxide gas, becomes heavier falls to the floor, and is then driven out through the openings under the mangers, as at 'K' passes up through 'foul air outlet' L. Y. W. If desired, and as recommended controlled openings may be left in the outlet passage or tubes near the ceiling, as at 'Z,' to be used in case of the stable becoming too warm. This system has been found satisfactory in many stables.

The air currents in the case of the Rutherford system of ventilation follow the course indicated by the double headed arrows. The air enters by passages passing underneath the walls. The external openings are protected by a species of hood (see 'Hood' in diagram). These passages might open into the stable immediately the wall was passed if the internal arrangement permitted, but may be conducted by underground or surface tubes or passages to whatever point or points may be considered most suitable. In this case air enters at 'R' behind the 'Hood' passes along underground passages and is discharged into stable at J. It circulates and escapes from the stable by 'foul air exit' G. W. This outlet should have a cross-section area of twelve square inches for each horse. The inlet capacity may be satisfactory if somewhat less. The outlet pipe is provided with a damper or key which permits of the air current being controlled. It is also well to provide the 'hoods' with keys or dampers to control the incoming air.

The stall divisions are made of two-inch plank low at the rear but high enough at the head to guard against 'weaving.'

COW BARN PLAN.

The accompanying plan (p. 48) of the cattle barns at the Central Experimental Farm is for the most part self-explanatory. A few additional remarks may, however, help make some points more intelligible.

LEVELS.

The floor is of cement. The main passage in the cow barn, in the bull barn and in the steer barn, as well as in the feed room, are all on the same level. The stands or stalls also, slopes neglected, show about the same height as the main passage, &c., above the ground line. The feed passages between rows of cows are six inches higher than the main passage, while the manure passages are about four inches lower. The manger bottoms are about one inch higher than the highest part of the stand or stall floor. The divisions between the mangers and the stands are of cement, six inches high next the manger, seven inches high next the stall and six inches wide. The gutters are eight inches deep next the cattle and six inches deep next the passage.

SLOPES.

The feed passages are about one inch higher in the centre than next the mangers, so facilitating cleaning and preventing any water lying thereon. The passages behind the cows are about one and one-half inches higher in the centre than next the gutters, so insuring any liquid manure running back to the gutters at once. The stands fall from the front to the rear at the rate of about one inch in four feet. The mangers have a fall of about three inches in their entire length of thirty-five feet, so permitting of their being easily washed or flushed out. The gutters besides being slightly lower on the side next the passage have a fall of about two inches in their entire length, so permitting of more easily handling the liquid part of the manure as well as helping keep the cows clean. The sides of the gutters are vertical.

DIMENSIONS.

The main passages are about seven feet wide. The feed and manure passages are uniformly six feet in width. The mangers are twnty-one inches wide with rounded bottoms. The gutters are 18 inches wide, with smooth, plane bottom. The stands vary in length, one stand compared with another, the longest stand being about six feet four inches from gutter to stanchion bed, the shortest showing scarcely more than four feet between the two similar points. Each stand varies in length from end to end of the row; for instance the longest stand is five feet nine inches at one end and six feet four inches at the other end of the row, while the shortest stand is four feet six inches at one end and only four feet at the other. All cement floors whereon cattle are supposed to walk or stand are given as rough a finish as possible.

LIGHT.

Windows as large as possible and as frequent as strength would allow occur in three sides of the stable as indicated in the plan. The windows on the southeast, the exposure on which the doors open, reach from the ceiling to within three feet of the floor, and are practically continuous, even the doors being glass in the upper parts. The main barn will accommodate about 90 head and is lighted by 450 square feet of glass, practically every foot of which admits the direct rays of the sun for a longer or shorter period every sunny day. This shows about five square feet of glass or light per head, which helps render things bright, cheerful and sanitary.

VENTILATION.

Fresh air is admitted at the floor level by means of air ducts bringing the fresh air from intakes just outside the walls. The openings total 15 feet in area or about 24 square inches per head.

The outlets are three in number situated near the middle of the stable, when considered from side to side; from end to end, one is about the middle and one near each end. Each outlet is 2 x 4 feet and leads directly to the peak of the roof. The total outlet area is thus about 24 square feet or about 36 square inches per head.

Both incoming fresh air and outgoing foul air currents are controlled by dampers or keys. It is thus possible to regulate the temperature to a nicety. During the past winter whatever the temperature outside, the thermometer inside stood around 48 degrees Fahrn., the temperature we decided would suit us best.

The windows are all hinged at the bottom excepting those that extend to the ceiling on the southeast exposure, these latter are hinged in the middle and all open in from the tops. They are held at about a 60° angle by means of chains. This permits of ample air currents when warm weather necessitates an otherwise abnormal circulation of air.

WATER.

Water is constantly in front of the cattle in small drinking fountains. If desired the mangers may be filled with water fit for drinking.

FACILITIES OR CONVENIENCES.

The feed room is not remarkably large but permits of preparing enough feed for two or three days for 150 or 160 head. It is situated close to the silos (700 tons capacity) near the meal bins and may be supplied with straw or hay from overhead. A root pulper is located as indicated in the plan. Roots have to be hauled in about once a week when being used in any considerable quantities.

The scale at the feed room door permits of easily weighing the feed, which is carried in carts running on the floor. Some cattlemen seem to consider the suspended feed carrier the better plan, but the writer cannot just exactly agree.

The manure is removed by barrows, there being no overhead tracks for this purpose any more than for the transportation of feed.

ACCOMMODATION.

The cattle are tied by means of stanchions. Swinging stanchions are used as they permit of cattle rising more easily and give them more liberty when on foot. The advantage of the stanchion over the chain lies in the fact that where stanchions are used stall divisions of a cumbrous or light-impeding character are not necessary When chains are used solid divisions are necessary to prevent horned animals from injuring each other.

The divisions in use here are constructed of 1½-inch boiler pipe. These are set one foot deep in the cement floor, rise vertically 2½ feet, turn at right angles and extend horizontally 2½ feet to be screwed into a species of bracket bolted to the 6-inch squared posts carrying the stanchion support. In the case of large cows, these pipes rise 3 feet instead of 2½ feet, the horizontal reach also being 3 feet in length.

Large cows are allowed 3 feet 8 inches clear between divisions, smaller animals having 3 feet 2 inches only.

WALLS AND CEILING.

The walls are of stone, but have recently been sheeted inside with 'V' joint. This, while costing considerable money, is an improvement the value of which in increased comfort and better sanitary condition can scarcely be over-estimated. The upper floor has been ceiled and here again the effect upon the cleanliness and brightness of the stable has been most marked.

STABLE VENTILATION.

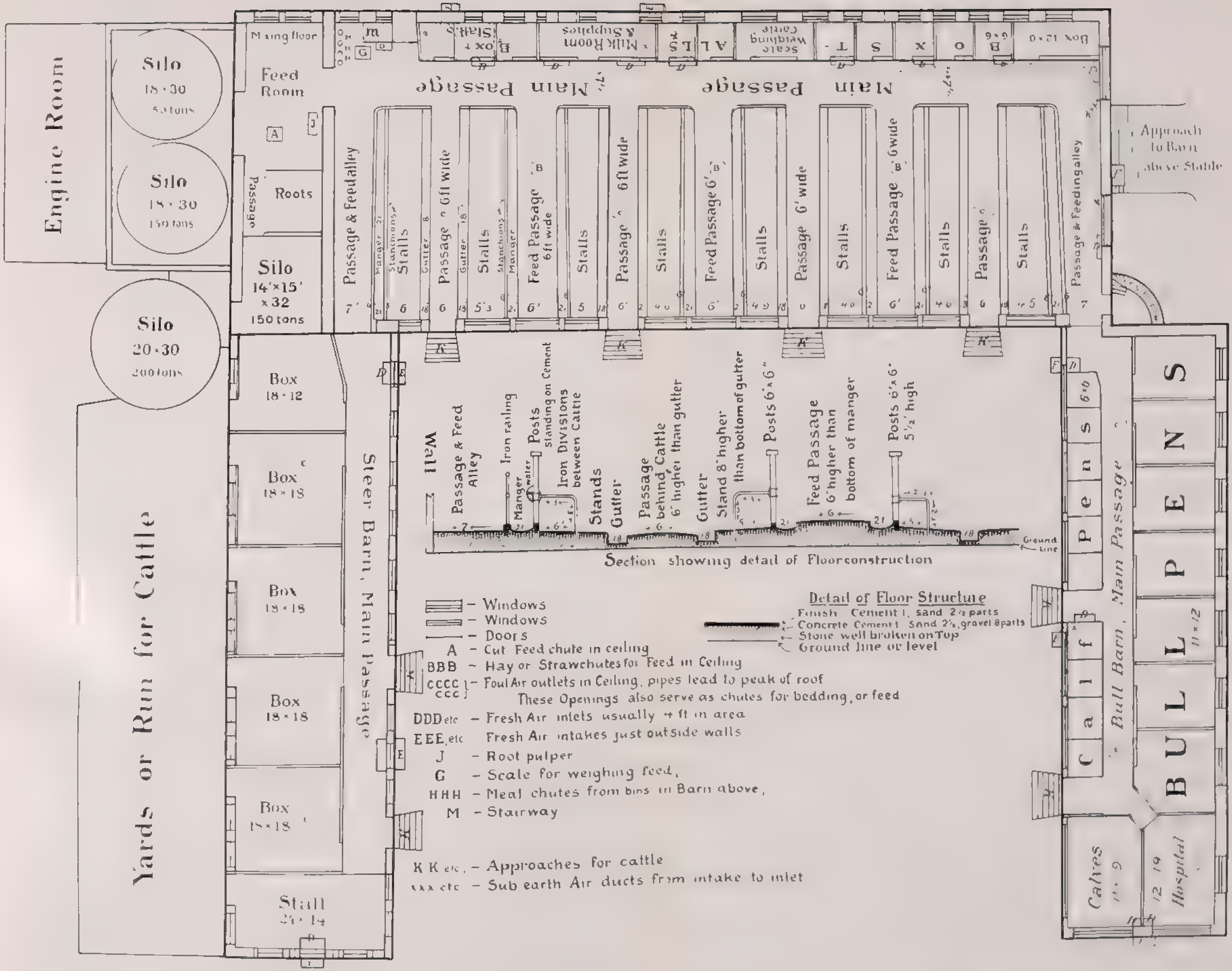
To the person whose business compels his frequenting country hotels and who not infrequently visits the homes of farmers of all nationalities in this cosmopolitan country of ours, one of the most striking and most common peculiarities observed is the lack of provision for ventilation. That our people are, under the circumstances, so healthy and long lived speaks well for robust Canadianhood. That tuberculous affections are common is not surprising; that even more do not suffer therefrom is astonishing, since an appreciation of the importance of a constant supply of fresh pure air seems to be strangely lacking.

Since our homes so frequently lack facilities for ventilation it is not surprising that our stables often show the same condition. But this difference is noticeable, much more effort has been made to ventilate the stable than the home.

The absolute need for pure air in our stables of all kinds is to-day conceded by practically every stock man. Yet only once in many visits does one find things right. The causes of imperfect success where efforts have been made are various. One of the most common is failure to give proper attention to the system installed. Another often met with is imperfect installation. While ignorance of what good ventilation really is accounts for the most failures of all.

To spend good money and careful thought installing a ventilating system only to neglect keeping it in operation is criminal. No effective system ever devised for use in stables is automatic in adjustment to varying atmospheric conditions. Changes in temperature or variation in wind velocity will always necessitate some change in the arrangement of the controls or checks.

Neglect to open or increase the capacity once it has been cut off in some measure in a cold time, is the most common cause leading to the condemnation of what might otherwise have been a good system. Another quite frequent cause leading to the condemnation of a system is the too small capacity of the installation. The average carpenter is apt to gauge the requirements of the stable in the way of air by the coldest weather requirements. For this reason, installations are very apt to be too



Ground Plan of Cattle Barns at Central Experimental Farm Ottawa, Ont.

limited in capacity for average weather conditions and much too limited for warm weather.

Then again an installation may be condemned unfairly, because the owner of the stable expects it to do more than any system of ventilation could ever do. A common standard by which the effectiveness of a system is judged is its ability to keep the walls and ceiling free from moisture. This is frequently a most unfair test. Precipitation of moisture on walls or ceiling is due to the warm vapour or water-charged exhalations of the animals, rising and lying for too great a length of time in contact with the cold wall or ceiling as the case may be. If the construction of wall or ceiling be faulty, as for instance where only double boards with paper between constitute the same, then no system of ventilation could keep them dry without lowering the inside temperature to practically the same as the outside. Walls possible of being kept fairly dry must have more or less insulation, that is a dead air space or a concrete core or shavings, or something to prevent too rapid conduction of heat. Then with a fairly rapid circulation of air the walls and ceiling may be kept dry. A ceiling protected by straw or hay overhead is the most satisfactory.

Walls with a dead air space may usually be kept dry quite easily. Stone walls or solid cement walls must be lined to insure their being fairly dry. No system of ventilation would otherwise ever keep them dry in very cold weather.

The number of cattle in a given cubic space is quite an important factor making for the effectiveness of any system. Too many cattle makes it difficult to ventilate in such a way as to avoid draughts, too few makes it impossible to keep the temperature up to the comfortable point and at the same time provide for sufficient air circulation. Low temperature does not always mean pure air, and here is a point where a great many stablemen make a mistake. The air in a stable where the thermometer shows several degrees of frost may quite easily be most vile. From all which it seems important, in the first place to so arrange matters that there shall be about the right number of animals in the given stable, allowing say from 600 to 800 cubic feet of air space for each bovine or equine animal two years old or over. This condition existing, there should then be provided 8 square inches or more of controlled outlet area and 6 square inches or more of controlled inlet area for each animal in the stable. For instance, a stable 36 x 30 x 10 which might be expected to accommodate 18 or 20 head should have an outlet at least 13 inches square, or 14 inches in diameter if round, and the inlet should be at least 10 inches by 12 inches.

By controlled inlets and outlets is meant that it should be possible to cut off the whole or any part of the outlet by means of some kind of a damper or key.

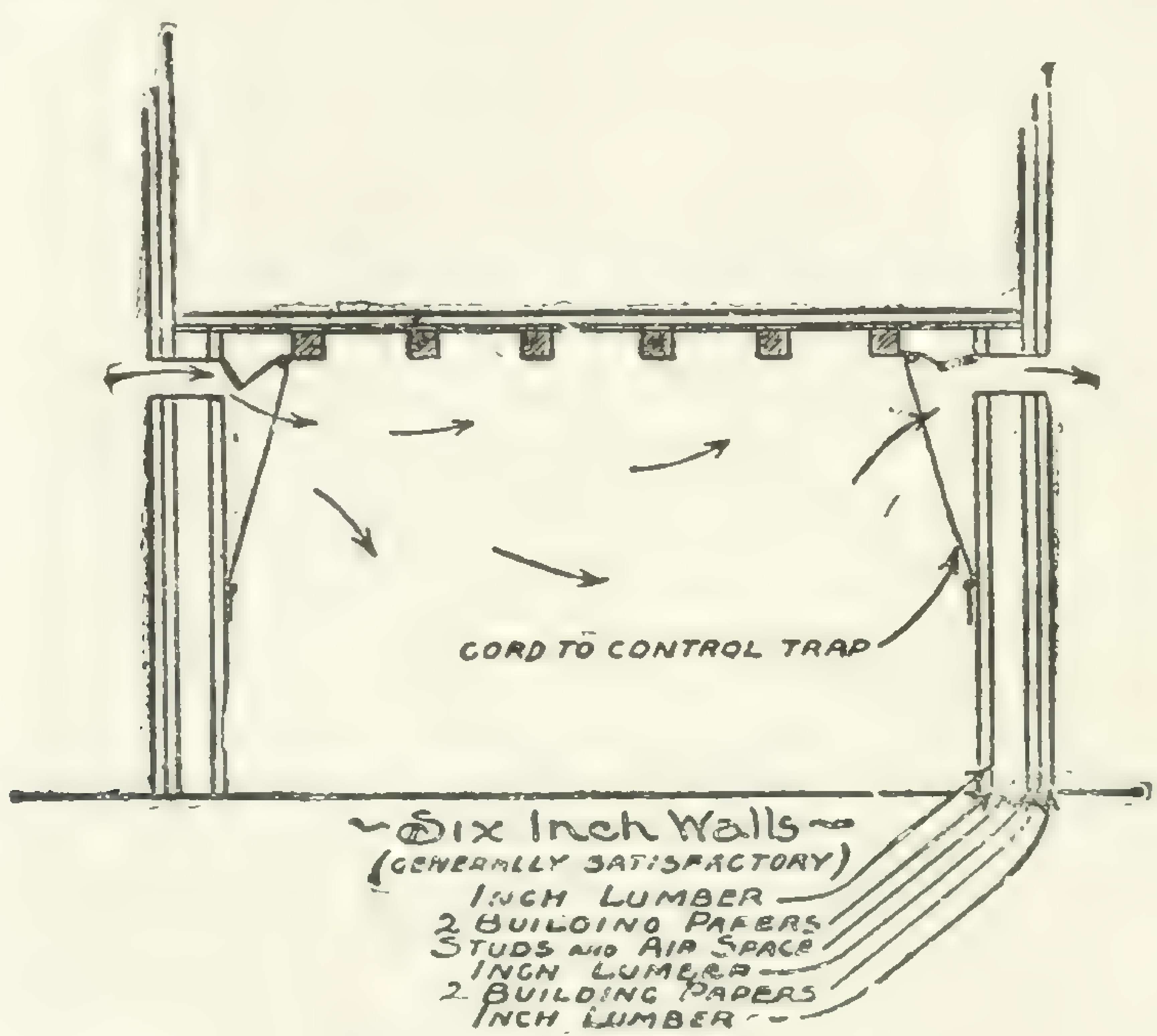
The controls are necessary for the reason that very cold air being much heavier than warm air compels a very much more rapid circulation or inflow and outflow of air in very cold weather than in warm. This must be controlled or temperatures will fall too low in cold weather and rise too high in warm weather.

The dimensions of shafts or outlets and inlets given above take little or no cognizance of friction, hence while 6 to 8 square inches in area per head would be sufficient in a large stable the same area in a small stable would likely be found faulty. Where warm, moisture laden air flows over, or in contact with a cold surface very heavy precipitation is sure to result, that is, there will be a heavy drip from the shaft. Where the shaft is large enough to permit of a slower current carrying off all the foul air, then the air in contact with the walls of the shaft moves more slowly than does the air in the centre of the shaft where friction is very light and as a consequence precipitation is very much less. In any stable therefore it is safe to make the outlet from 25 to even 100 per cent larger in cross-section or area than would generally be considered large enough. That is for 18 or 20 cows, instead of allowing an outlet shaft about 13 inches square or of about 170 square inches, allow an outlet of anywhere from 225 to 350 square inches cross-section area. The inlets need not be materially enlarged since the same moisture surcharged condition does not exist in the incoming air as in the outgoing.

As already indicated, the methods of ventilating stables are various indeed, and a number of systems or methods have been tested at the Central Experimental Farm and brief descriptions and diagrams illustrative of some of them are submitted below. In a general way each of these systems may be said to have been successful:—

SYSTEM OF VENTILATION 'A'—PIERCED WALLS.

This system of ventilation is simple and cheap of installation. All that is required is the piercing of square or round holes on all sides exposed to air. These holes or openings in our standard stable (30 x 36) should be 4 inches in diameter at three feet intervals, or 6 inches in diameter at 6 feet intervals in at least three sides of the building. They had better be provided with some sort of door or key to control either incoming or outgoing currents of air. The fresh air, will, if permitted, enter from the side against which the wind strikes. Hence the openings serving as inlets one day or at one moment may be outlets the next moment or any other day, depending of course upon the direction of the wind. When calm prevails, internal influences will exert the controlling forces as to which openings shall act as inlets and which others as outlets.



Plan A—Pierced Walls.

The controlling and limiting of the rate of inflow of air is essential. The outflow will usually require that the controls or keys be fully open. The temptation to partially plug the holes with wisps of hay or straw must be guarded against.

SYSTEM OF VENTILATION 'B'—VENTILATION BY CONVECTION.

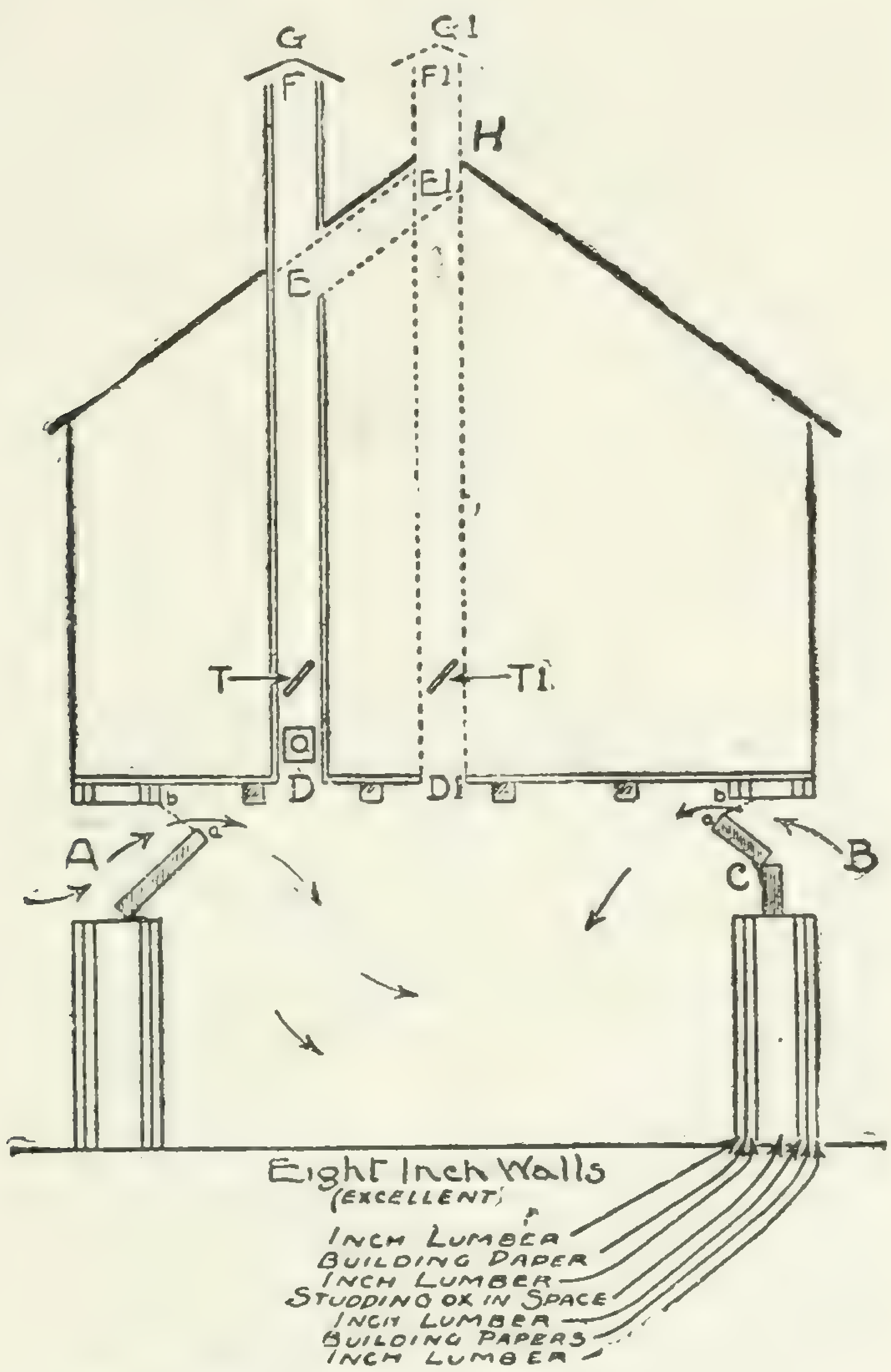
In the system described below the proper distribution of pure air throughout the stable depends for the most part upon convection or circulation of air in the lower half of the stable due to the heat from the animals causing displacement of the lower air which when warmed will ascend and be replaced by cool fresh air entering by 'A' or 'B' or by both or numerous similar openings.

The impure air leaves the stable by outlet D.

C C are windows hinged at the bottom and held in position by small chains from a to b. The windows may be of any desired width or height. If very high it is advisable to have the lower half stationary and the upper hinged thereto as in B.

The outlet D E F for such a stable as mentioned, if single, should be about two feet square. If it is preferred to have two outlets as is probably somewhat better then each outlet should be $1\frac{1}{2}$ feet square. This outlet pipe D E F may be in the

centre or to one side. So far as satisfactory working is concerned I may say that we have had almost equally good results when the pipe took the courses D E F, D E[1] E[1] F[1] or D[1] E[1] F[1] provided always that the outlet F or F[1] was 2 or 3 feet higher than H the apex of the roof. To prevent in some measure inflow of snow or rain a cap G should be constructed over the outlet pipe. If conveniently situated, D might serve as an opening through which to drop bedding or feed.



Plan B—Ventilation by Convection.

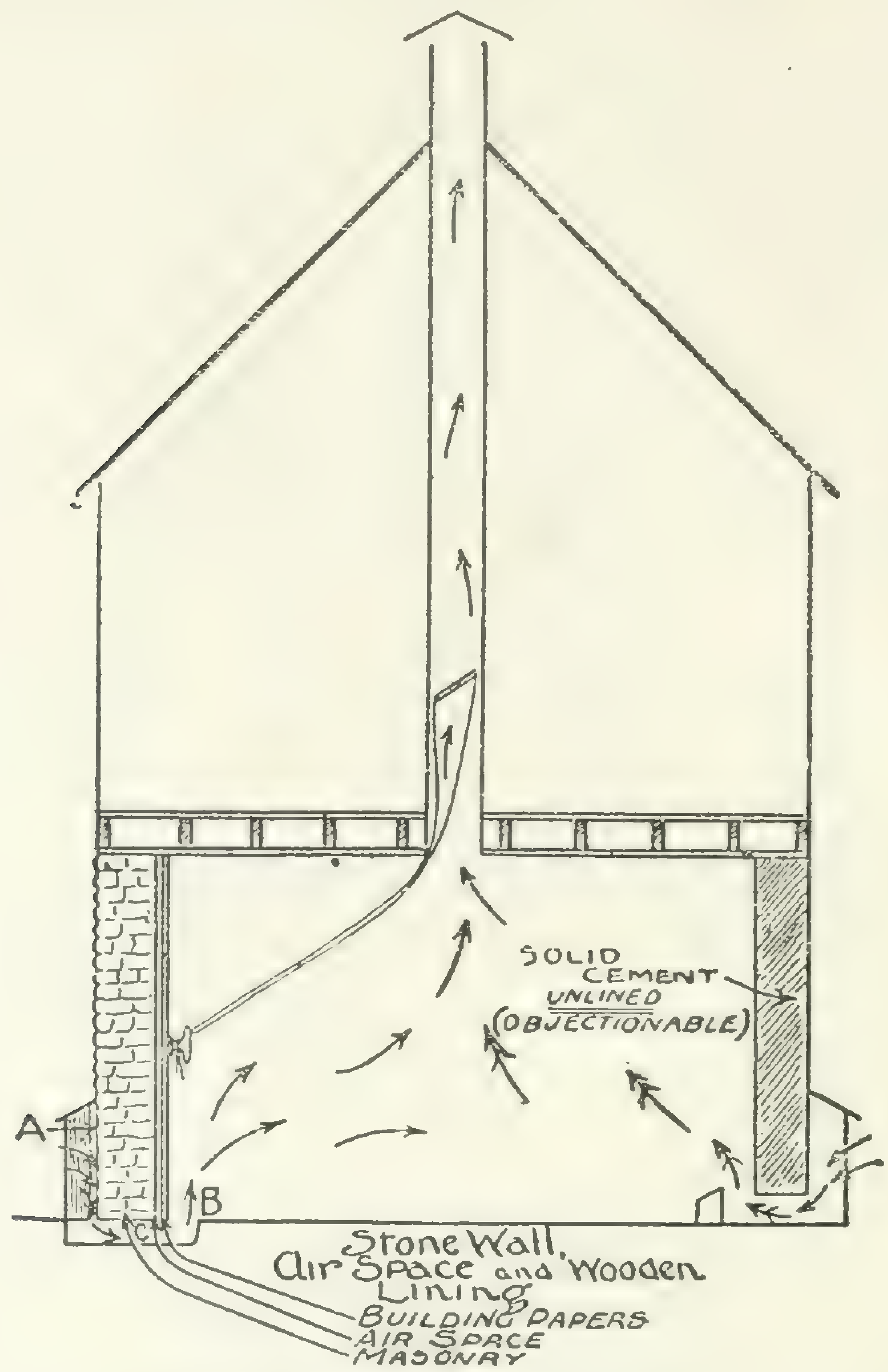
The amount of air to escape through the outlet is controlled by the trap T which may be regulated by cords descending into the stable.

SYSTEM OF VENTILATION 'C'—THE RUTHERFORD SYSTEM.

This system is no doubt pretty well known to most readers, but a few descriptive paragraphs will probably not be out of place. It is the system most commonly used here for the reason that it has proven to be most simple of manipulation and affords the least opportunity of being badly worked or blocked by cattlemen unwisely anxious as to the comfort of their charge.

This system requires that the air enter at or near the floor level. The best plan of bringing it in is probably as shown on the left hand side in the diagram where the single-headed arrows indicate the entrance of the air and its passage through A.C.B. under the wall. When the air current enters the stable it has an upward direction, which it retains in some degree, but once free from the confining passage it spreads and takes usually the course indicated by the single-headed arrow.

If for any reason it is not considered advisable to pass under the wall, then an opening through the wall at the level of the floor will serve the purpose. In such case it will, however, be found necessary to so surround the opening into the stable as to



Plan C—Rutherford System.

give the entering air current an upward tendency. The air current would then follow the directions indicated by the double-headed arrows. As to outlet, the same plan serves as was described in writing of Ventilation Plan 'B.'

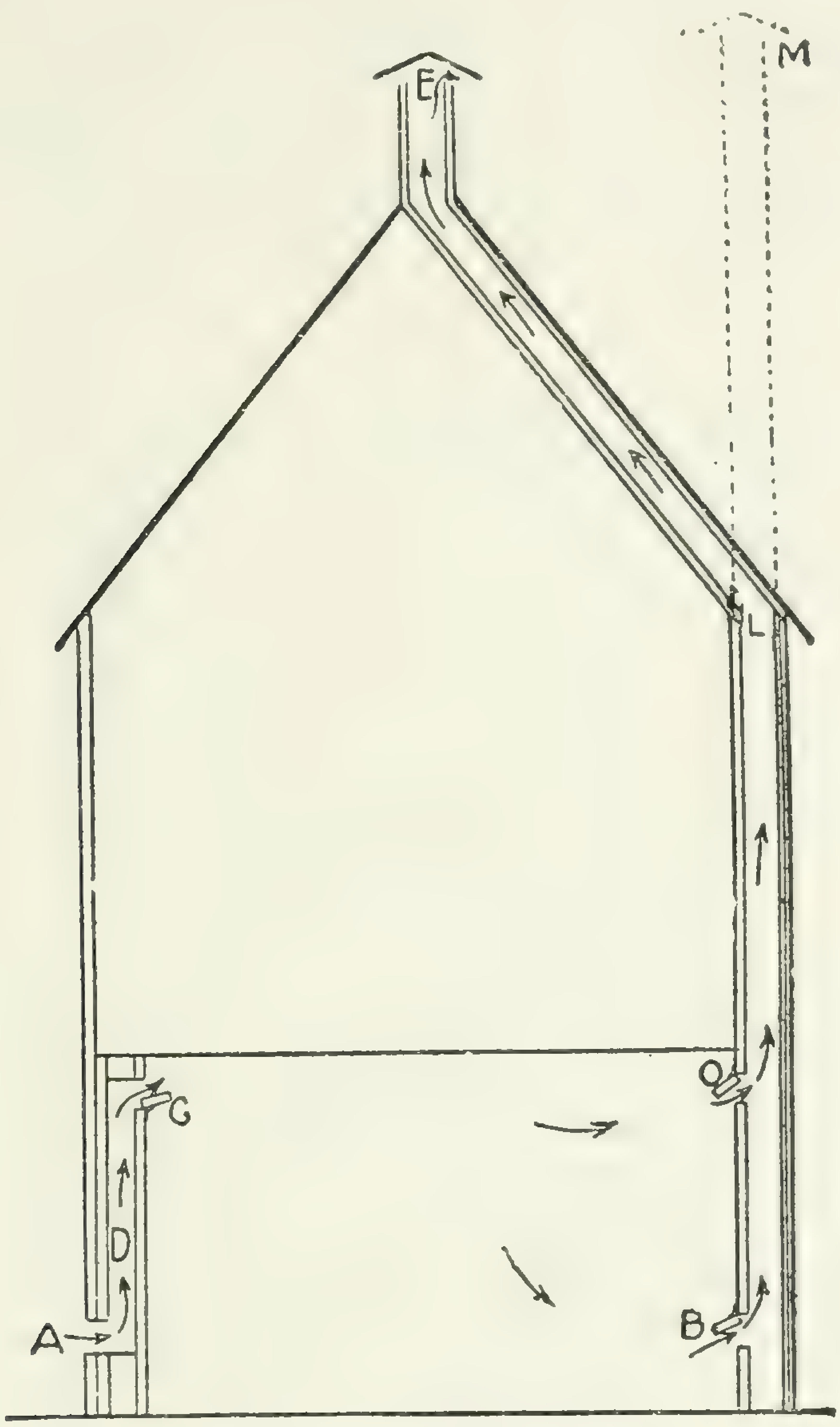
SYSTEM OF VENTILATION 'D'—THE KING SYSTEM.

Like the system just discussed, the King system is probably known to many readers. It has many admirers, and many have succeeded with it. It is most remarkable in this that the foul air is drawn from the floor and the fresh air enters at the ceiling. In the previously discussed systems, as will be remembered the foul air in every case was drawn from the ceiling, while the fresh air came in at different points from the floor to the ceiling according to the system being considered.

The advocates of the King system claim that since carbonic acid gas is the chief impurity in stables, and since this gas is heavier than pure air, it is likely to be found in largest quantities near the floor, and therefore outlets for impure air should begin near the floor level.

In the cross section diagram the inlet is shown by arrows running from A to C. The outlet begins at B and the foul air goes up the tube and out at E. Both inlets and outlets occur on each side, and should be at intervals of about 10 feet, say 3 of

each on each side. Where this number occur, then each inlet and each outlet should have a cross sectional area of at least 60 square inches, say 4 inches x 15 inches. Where it is intended to install this system it should be provided for when building the walls. Spaces between the studs will serve for both inlets and outlets.



Plan D—King System.

The outlet B L E might be modified to take the course B L M, in which case it would probably be necessary to extend M above the level of the apex of the roof. At O openings should be made into the outlets so that the warm air at the ceiling may be allowed to escape when the average stable temperature rises too high.

The chief objection to this system is the large number of long pipes or boxes necessary to admit pure air, and discharge foul air as the case may be.

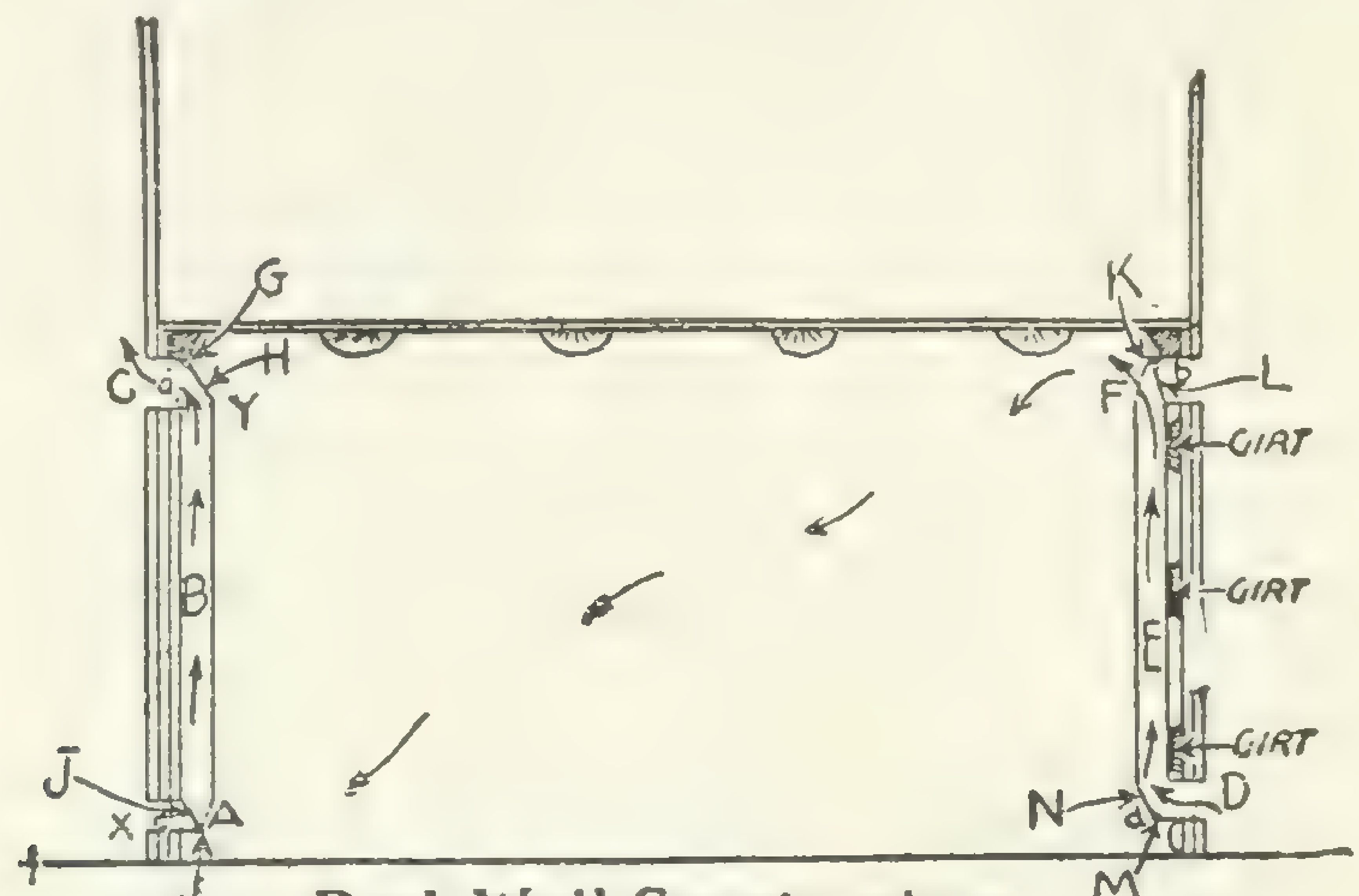
This objection is particularly in evidence when it becomes necessary to instal the system in an old building. A modification of the system and one that is easy of introduction in an old or new wooden building is given below.

SYSTEM OF VENTILATION 'E.'

This system, a modification of the King permitting of cheap and easy installation in either new or old frame or log buildings, is one which the writer devised and put into operation some years ago at the experimental farm and elsewhere. It has worked very satisfactorily wherever installed. That it is cheap as well as effective, is proven by the fact that in a stable for 22 cattle it cost $12 for labour and material. The pipes in this system are entirely inside the stable. For 20 cattle in the standard stable

these should be six in number, each about 12 inches x 6 inches or 12 inches x 7 inches in cross-section, 3 on each side (east and west sides if possible).

Each ventilation pipe must have two openings to the outside air, one, an inch or so below the ceiling level as a and b, and the other 6 inches to 8 inches above the floor level as c and d. These openings should be of the same dimensions as the pipes. The air enters the building by passing into the right hand pipe at D up past E and into the stable at F at the ceiling. It circulates through the building, enters the outlet at A passes up through B and out at C. If the wind were blowing, from the left, however, it would enter at x up through B and out into the stable at y finding its way out by entering the right hand tube at d passing up through E and out at b.



Bad Wall Construction
Two-Ply Inch Lumber, Paper Between.

Plan E – Modified King System

H J L N represent barriers or trap doors hinged at G I K and M respectively. As set in diagram air enters by D E F and discharges by A B C. If set as per dotted lines then entry would be by X B y and discharge by d E b.

When properly attended to this is an exceedingly satisfactory system, but when neglected does not always work well. If desired, trap doors H J L U may be arranged so as to permit of air entering directly, that is by flowing through X A and D d and leaving stable at ceiling that is b and Y C, which would be a modified Rutherford system. This latter modification works well in warm weather.

MUSLIN CURTAIN VENTILATION.

In addition to the above an experiment in muslin curtain ventilation has been conducted here recently and a report thereon will probably be of interest.

The stable in which the experiment was carried on is a well built, well lighted and well ventilated (otherwise than by muslin curtain system) building about 100 x 25 ft. with a 10-foot ceiling. It is divided into six box stalls and was, during the time the experiment was under way, occupied by 37 head of cattle (steers 1 and 2 years old). During the experiment with muslin curtain ventilation the inlets and outlets of the other system of ventilation were kept closed. The building where the experiment was carried on is known as the steer stable.

On each side of the building are 10 windows each 2½ ft. x 4 ft.

These windows are 6 feet from the floor and extend to about 18 inches from the ceiling. They are hinged at the bottom and are, by means of chains, held at an angle of about 60 degrees with the floor when open. It is evident, therefore, that the air that managed to get through the 'muslin' met no further opposition in getting into the stable. The only effect of the windows standing at 60° angle was to start any air currents upward rather than downward and so caused a more perfect intermixture of the incoming air with that already in the stable.

The curtains covered the whole window area, being held in place on the frames outside by means of laths nailed over the margin of the cotton. The cotton used was of two grades: Grade 1, the cheapest grade of grey cotton costing 6 or 7 cents per

yard; Grade 2, cheese cloth. On the east side were 5 cotton and 4 cheese-cloth curtains. On the west side were 4 cotton and 5 cheese-cloth curtains.

The experiment lasted 40 days and was most interesting. For instance, during a few warm days when the thermometer showed about 40° Fahr. outside and there was no breeze blowing, the inside steer stable thermometer showed 82° in spite of the fact that every curtained window (18 windows 4 feet x 2½ feet) was open. As soon as the doors were opened, however, the temperature began to fall and in a short time the thermometer showed only a few degress more heat than the outside.

The following record of inside, that is steer barn temperature, and outside temperatures as well as record of temperatures in the main barn or cow stables (where another system of ventilation was in operation) and a few notes on the wind will be self-explanatory and instructive.

REPORT ON MUSLIN VENTILATION EXPERIMENT.

—	December 23rd.				December 24th.			Remarks.
	12 a.m.	2 p.m.	5 p.m.	10 p.m.	5 a.m.	9 a.m.	12 a.m.	
Open air	* 26	27	30	28	26	24	24	*Windows open both sides of steer stable.
Cow stables	50	52	53	52	50	50	50	
Steer stable	52	53	57	62	46	44	42	
Wind	V. light.	V. L.	V. L.	Calm.	Breeze.	Light.	Light.	

—	December 24th.			December 25th.			Remarks.
	3 p.m.	5 p.m.	11 p.m.	5 a.m.	9 a.m.	12 a.m.	
Open air	27	25	20	14	14	16	
Cow stables	51	52	50	48	48	48	
Steer stable	51	52	50	50	55	52	
Wind	V. L.	Light.	Calm.	Calm.	V. L.	V. L.	

—	December 25th.			December 26th.						Remarks.
	3 p.m.	5 p.m.	11 p.m.	5 a.m.	9 a.m.	12 a.m.	3 p.m.	5 p.m.	11 p.m.	
Open air	* 18	21	15	† 18	8	13	15	‡ 8	§ 2	*Windows open both sides of steer stable.
Cow stable	48	48	47	47	47	46	50	50	47	†Closed 1 side of steer stable.
Steer stable	50	52	56	35	42	46	52	58	62	‡Opened up window again.
Wind	V. L.	V. L.	Calm.	Breeze.	Light.	Calm.	Calm.	Calm.	Calm.	§Steer stable full of fog and dripping wet.

—	December 27th.						December 28th.			Remarks.
	5 a.m.	9 a.m.	12 a.m.	3 p.m.	5 p.m.	12 p.m.	5 a.m.	9 a.m,	12 a.m.	
Open air	* 14	20	20	28	22	33	32	36	† 34	*Window open as at commencement.
Cow stable	47	49	50	52	52	49	53	50	51	†Windows open both sides of steer stable.
Steer stable	50	48	58	50	46	58	44	56	58	
Wind	V. L.	V. L.	Calm.	V. L.	Light.	Light.	Breeze.	V. L.	V. L.	

Summary.	Max.	Min.
Open air	36	2
Cow stable	53	46
Steer stable	62	36

The maximum and minimum columns of the above table are eloquent of the one great weakness of this system of ventilation. While the temperature where one system of ventilation was in operation varied only 8 degrees in spite of a variation of 34 degrees outside, the temperature of the stable where the muslin curtain ventilation was in operation varied 26 degrees, although every effort was made to maintain a uniform temperature by opening and closing curtained windows as necessary.

It might be objected that not temperature but pure air is the consideration. This is true of course, but in a stable so well built as the one where the experiment was conducted, to maintain a temperature of from 45 to 50 will permit of excellent ventilation. When this temperature maintains inside, a person breathes quite comfortably and has none of the sensations due to impure air and so regrettably well known to most of us who are accustomed to visit stables in this country.

In favour of this system it may be said:—

1. That with the exercise of much care it is possible to ventilate by means of muslin over window or other opening, and that of the two cheese cloth is to be preferrred to grey cotton since a smaller area will do the work and do it better.

2. That it is cheaply installed and much better than no ventilation.

The objections appear to be:—

1. Very great watchfulness necesssary to insure a fair measure of success.

2. Danger of too great a fall or rise of temperature in the night due to rise or fall of wind.

3. Darkening of stable due to presence of muslin on windows, which renders stable gloomy and damp.

4. The fouling of the muslin on account of changing directions of air currents which wet the curtain permitting foul air to escape and so the curtains soon get muddy in appearance and unsanitary in condition.

DAIRY CATTLE.

The herd of dairy cattle during the year 1907-8 consisted of 45 females all told. They were:—

	Head.
Ayrshires	10
Guernseys	9
Canadians	6
Shorthorns	10
Grades (various breeding)	10

FEEDING THE DAIRY COWS.

During the year 1907-8 the problem 'How can milk be produced cheaply,' has been exceedingly difficult of solution here as elsewhere in eastern Canada. The dry cold summer, shortened grass, lightened grain, lessened hay and diminished root and corn crops, so that feed of every description was remarkably scarce and very high priced. Dairy herds were accordingly considerably reduced in the autumn of 1907. In spite of this fact, however, feed prices have remained at an abnormally high level and the only redeeming feature has been the high prices that have maintained for dairy products of all description.

At the Central Experimental Farm, as usual, only a small area was given over to the cattle for pasture. The dairy cows, some forty-five in number, were allowed only 14 acres or thereabouts whereon to graze. This proved quite satisfactory till about the middle of July. After this date, however, the continued dry weather necessitated supplementing with some other roughage. As a considerable quantity of ensilage had been left over, all classes of cattle got all they needed of corn silage in

addition to what grass managed to grow. Along with the silage was fed a suitable meal ration, bran and oats.

During the months of June, July, August, September, October and part of November, the stables were being overhauled or remodelled. As a result, on account of disturbances and frequent change of quarters it was impossible to keep the cows up to their usual milking records, although the cost of feeding was greater than usual.

The winter feeding has been somewhat more successful than the summer, although as may be supposed it was not found possible to jump the cows to their old levels as soon as conditions improved. On the contrary it has taken to the present moment to get things running smoothly once more so far as the cows are concerned. Some of them do not seem to have recovered entirely even yet.

The winter ration, roughly speaking, has consisted of—

	Lbs.
Hay	5
Ensilage	35
Roots	12
Straw	4
Meal	8

The hay fed has for the most part been red clover fed long.

The ensilage was usually corn silage of extra good quality; well preserved and rich in grain.

The roots were mangels, fed sometimes whole and separately, sometimes pulped and mixed with silage and straw.

The straw was oat straw cut and mixed with the ensilage, or ensilage and pulped roots.

The meal mixture, when experiments were not under way, consisted of 800 lbs. of bran, 300 lbs. gluten and 100 lbs. oil cake meal or vice versa so far as the gluten and oil cake meal were concerned.

Three times each week what are known as 'mixing days' occur in our stables. All the cattlemen take part. The root pulper is started, the silo is opened up, the cut straw is hauled to the trap and then operations begin. One man feeds the pulper, one man gets into the silo, one man hauls the silage on truck or barrow to the mixing floor and the fourth mixes the component parts in the right proportions. First a three-inch layer of ensilage is spread on the mixing floor or bed, this is followed and covered by a 2 or 3 inch layer of cut straw on which is then spread a comparatively thin looking layer of pulped roots. Again comes a layer of silage of the same thickness as before followed by straw, followed by roots. This repeated till the required amount is piled on the floor, that is, enough for either two or else three days as the case may be. That the mixing is no light job, especially on Fridays when three days' roughage is prepared may be imagined when it is remembered that during the past winter from 150 to 160 cattle were on feed.

The roughage as above prepared is loaded into the feeding trucks in the proper amounts, and run out to the different lots or rows of cattle. This is done twice daily, 7 a.m. and 3 p.m., or 5.30 a.m. and 4 p.m. So far as one may judge by results, feeding at 7 a.m. and 3 p.m. is as satisfactory as feeding at 5.30 a.m. and 4 p.m.

To revert to method of feeding, as soon as the roughage mixed is fed the cows, the meal is scattered on top thereof and the whole mass given a stir with the fork or shovel. After the roughage mixture and meal have been pretty well eaten up the cows receive a small amount of long hay, about two pounds each. Such is the regular plan of feeding morning and afternoon. If, however, as sometimes happens, it is not possible or convenient to pulp the roots, these are fed whole about noon or early in the afternoon.

The amount of roughage fed depends on the appetite of the cow; the amount of meal is influenced rather by the amount of milk being produced by the cow in ques-

tion. Her meal ration is gradually increased after calving, until at three or four weeks in milk she is supposed to be on full feed. The amount of meal is judged by the milk produced. If she responds freely to increases in meal, she is fed the more liberally, usually up to that point where an increase in meal does not seem to induce a relatively liberal increase in milk flow. One pound of meal for four pounds of milk is liberal feeding; one pound of meal for three pounds of milk, to leave a profit necessitates selling milk at a higher price than the average farmer may hope for. In this connecton it may be observed that the quality or composition of the meal ration is usually an important factor affecting the milk yield. It is exceedingly important, however, to remember that palatability in the meal as well as in the roughage is an influence that is not infrequently underestimated. Variety in meals fed is advisable, but variety should mean a blending of meals, not a substitution of one for another at frequent intervals. To illustrate, it is much better to feed a mixture of bran, oats, barley, oilmeal, gluten, cotton seed meal, &c., than to feed any one of them for a time, to be subsequently replaced by some other.

Generally speaking, the meal ration for dairy cows should be rich in protein, palatable, easily digested and fairly finely ground, and blended to suit the roughage ration with which fed. Meals vary greatly as to composition and effect upon digestive organs of cattle. While some are laxative, some are constipating in effect, and while some seem to develop appetite others have the opposite effect.

INDIVIDUAL COW RECORDS.

The records which follow are rather lower than usual, for the reasons already given that building operations interfered with the proper care of the herd. The butter is valued at 24 cents per pound. It was really sold at from 25 to 35 cents per pound.

Some of the cows suckled calves part of the time, hence did not make as good records as would otherwise have been the case.

COST OF FEEDING.

In estimating the cost of feeding, the following prices were charged for feed stuffs, being the average local market rates for the same during the season of 1907, save in the case of ensilage and roots, which are charged for at the rate usually affixed in experimental feeding in all parts of America.

Pasture per month	$ 1 00	per cow
Bran	18 00	per ton
Gluten meal	28 00	"
Oil meal	30 00	"
Oats and barley	21 00	"
Clover hay	7 00	"
Chaff	4 00	"
Roots and ensilage	2 00	"

In estimating the value of the product, 24 cents per pound is allowed for the butter and 15 cents per 100 pounds for the skim milk. The butter sells at from 25 to 35 cents per pound.

The Central Experimental Farm dairy herd records as given below make only a moderate showing. No effort is being made just at present to get particularly large yields from the cattle, the aim being now to get some good breeding stock. As will be noted, the pure-bred cows are being milked for rather shorter periods than usual. This is on account of their being bred to come in at as short intervals as possible.

COW RECORDS FOR YEAR, APRIL 1, 1907 TO MARCH 31, 1908.

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for period.	Per cent fat in milk.	Pounds butter produced in period.	Value of butter at 24 cts. per lb.	Value of skim milk at 15 cts. per 100 lbs.	Total value of product.	Amount meal eaten, valued at 1c. per lb.	Amount of roots and ensilage eaten, at $2 per ton.	Amount of hay eaten, valued at $7 per ton.	Months on pasture at $1 per month.	Total cost of feed for period.	Cost to produce 100 lbs. of milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. of butter, skim milk neglected.	Amt. of straw eaten, valued at 20 cts. per cwt.	Profit on cow during period, labour neglected.
				Lbs.	Lbs.	p. c.	Lbs.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Mos.	$ cts.	cts.	cts.	cts.	Lbs.	$ cts.
Alma. .... (G.G.)	7	May 28, '07	285	26·5	7,561	4·8	428·61	102 86	11 70	114 56	1,999	16,211	1,137	4	44 63	59·	10·4	13·6	230	69 93
Flavia .... (A.)	6	Jan. 5, '07	300	30·7	9,214	3·8	421·21	101 09	13 19	114 28	2,064	16,451	1,137	4	45 28	49·1	10·9	13·1	105	69 00
Itchen Lady .... (G.)	11	" 13, '07	366	29	7,648	4·7	427·30	102 55	10 83	113 38	2,035	16,211	1,137	4	45 00	58·8	10·5	13·5	230	68 38
Deanie .... (G.)	11	" 1, '07	366	20·4	7,493	4·6	413·81	99 31	11 62	110 93	2,067	15,496	1,137	4	44 61	59·9	10·7	13·3	230	66 32
Zamora .... (C.)	12	Oct. 21, '07	306	23·1	7,072	4·9	412·63	99 03	9 99	109 02	2,292	15,886	1,187	4	47 25	66·8	11·7	12·3	145	61 77
Jessie A .... (A.)	14	April 13, '07	256	29·2	7,486	4·	353·71	84 89	11 69	96 58	1,685	11,743	641	4	34 90	46·6	9·8	14·2	30	61 68
Maggie .... (A.)	12	" 29, '07	316	27·5	8,697	3·8	395·09	93 92	12 45	106 27	2,240	16,156	1,137	4	47 01	54·	12·1	11·9	230	59 26
Ottawa Lass .... (S.)	6	May 12, '07	306	26·2	8,032	4·	380·51	91 32	11 49	102 81	2,044	15,326	1,047	4	43 99	54·7	11·8	12·2	230	58 82
Denty .... (A.)	9	Mar. 23, '08	310	25·8	8,003	3·9	370·78	88 98	11 45	100 43	1,936	16,052	1,137	4	43 60	54·5	12·	12·	105	56 83
Fortune d'Oka .. (C.)	10	" 4, '08	286	26·2	7,500	4·2	371·36	89 12	10 69	99 81	1,905	15,919	1,135	4	43 23	59·6	11·9	12·1	145	56 58
Queenie .... (G.G.)	10	July 4, '07	277	16·4	4,534	6·4	344·29	86 63	6 28	92 91	1,525	15,291	1,137	4	38 97	85·8	11·3	12·7	229	53 94
Poupée .... (C.)	5	April 6, '07	336	22·3	7,505	4·	359·55	86 29	10 72	97 01	2,051	15,406	1,137	4	44 30	50·	12·6	11·6	199	52 71
Marjorie .... (A.)	6	Feb. 22, '08	284	26·	7,391	3·9	337·44	80 99	10 58	91 57	1,985	16,156	1,137	4	44 45	60·1	13·4	10·6	229	47 12
Dolly .... (G.A.)	7	Mar. 19, '08	300	23·8	7,146	3·8	325·56	78 13	10 23	88 36	1,801	15,862	1,137	4	42 25	59·1	12 9	11·1	205	46 11
Inoquette .... (C.)	6	Feb. 12, '08	286	22·6	6,479	4·1	316·65	76 00	9 26	85 26	1,863	15,341	1,137	4	42 37	65·5	13·6	10·4	199	42 91
Illuminata II .... (S.)	5	June 4, '07	325	22·1	7,184	3·7	313·66	75 26	10 39	85 56	2,031	16,966	1,047	4	44 61	62·	14·5	9·5	229	40 95
Wedgewood's Pearl (G.)	5	Feb. 6, '08	315	13·9	4,373	5·6	290·	69 60	9 81	79 41	1,566	14,950	1,137	4	38 80	88·7	13·4	10·6	105	40 61
Labelle .... (C.)	4	" 28, '08	326	16·3	5,324	4·5	283·21	67 97	7 56	75 53	1,917	14,985	1,047	4	41 82	78·1	15·1	8·9	......	33 71
Gurta .... (A.)	7	Jan. 3, '07	346	17·2	5,977	4·1	290·10	69 62	8 53	78 15	1,981	16,311	1,137	4	44 56	74·5	15·7	8·3	229	33 59
Denty III .... (A.)	5	" 31, '07	366	14·7	5,389	4·5	287·16	68 92	7 65	76 57	1,968	15,701	1,133	4	43 81	81·6	15·6	8·1	229	32 78
Ottawa Itchen .... (G.)	3	June 19, '07	255	16·	4,094	5·	240·75	57 78	5 78	63 56	1,470	11,716	912	3	33 07	80·7	16·1	7·9	229	30 49
Alice .... (G.A.)	6	Mar. 12, '08	311	19·2	5,986	3·6	257·60	61 82	8 60	70 42	1,915	15,685	1,137	4	43 23	72·2	16·7	7·3	215	27 19
Ruby .... (G.)	9	Sept. 18, '06	251	17·1	4,311	4·8	246·43	59 14	6 10	65 24	1,742	16,006	1,140	4	41 81	96·	17·	7·	190	23 43
Ottawa Spot .... (G.)	4	" 18, '07	310	14·7	4,563	4·4	235·68	56 55	6 49	63 04	1,917	14,501	1,230	4	42 43	93·2	18·	6·	229	20 61
Fannie .... (G.C.)	4	Dec. 9, '07	272	11·	2,991	4·4	158·33	53 83	4 30	58 13	1,618	14,280	1,168	4	39 01	1 30·4	24·6	......	229	19 12
Ottawa Marchioness (S.)	5	May 23, '07	284	16·3	4,632	4·	221·23	53 09	6 67	59 76	1,687	16,061	1,137	4	41 37	89·3	18·7	5·3	229	18 39
Pearly Prize .... (G.)	4	Dec. 10, '07	96	20·1	1,930	5·3	120·75	28 98	2 72	31 70	599	5,773	605	......	14 34	74·3	11·8	11·2	229	17 36
Flora .... (G.C.)	5	Mar. 30, '07	366	11·9	4,366	4·3	222·41	53 36	6 22	59 58	1,921	14,881	1,137	4	42 52	97·3	19·1	5·9	229	17 06
Soncy .... (A.)	2	Oct. 3, '07	144	20·6	2,979	3·5	124·44	29 87	4 28	34 15	765	7,606	742	......	18 32	61·5	14·7	9·3	229	15 83
Janet II .... (S.)	3	June 10, '07	270	14·6	3,953	4·1	190·66	45 76	5 64	51 40	1,527	13,276	954	4	36 35	91·9	19·	5·	229	15 05
Denise Duchesse .... (C.)	8	" 28, '07	255	18·5	4,734	3·6	200·21	48 05	6 80	54 85	1,654	15,866	1,137	4	40 79	86·1	28·1	......	199	14 06
Dora .... (G.G.)	3	Nov. 20, '06	199	15·4	3,082	5·9	215·95	51 82	4 30	47 52	1,324	14,217	1,137	4	35 83	1 16·2	16·5	7·5	205	11 69
Duchesse II .... (C.)	2	Dec. 18, '06	286	12·2	3,493	4·5	185·57	44 54	4 96	49 50	1,590	14,812	1,137	4	39 04	1 11·	21·5	3·5	175	10 46
Duchess II .... (S.)	3	May 25, '07	193	11·7	2,264	5·2	140·24	33 66	3 19	37 85	1,076	11,185	864	2	27 43	1 21·	19·5	4·5	229	10 42
Flossy Maid .... (G.)	3	Jan. 5, '08	63	19·5	1,232	5·1	74·13	17 76	1 73	19 52	477	3,388	321	......	9 57	77·6	12·8	11·2	147	9 95
Marchioness II .... (S.)	3	Dec. 5, '07	91	18·7	1,705	4·2	84·43	20 26	2 43	22 69	721	5,456	575	......	14 89	87·3	17·6	6·4	105	7 80
Whitie .... (G.S.)	7	" 14, '06	255	13·9	3,559	4·5	189·15	45 40	5 05	50 45	1,863	15,665	1,137	4	42 72	1 20·	22·5	1·5	229	7 73
Bellflower .... (G.G.)	8	July 4, '07	275	12·	3,309	4·1	160·28	38 47	4 72	43 19	1,465	15,800	1,137	4	38 88	1 17·1	24·2	......	229	4 31

COW RECORDS FOR YEAR, APRIL 1, 1907, TO MARCH 31, 1908.—*Continued.*

Names of Cows.	Age.	Date of dropping last calf.	Number of days in milk.	Daily average yield of milk.	Total milk for period.	Per cent fat in milk.	Pounds of butter produced in period.	Value of butter at 24 cents per lb.	Value of skim milk at 15 cts. per 100 lbs.	Total value of product.	Amount of meal eaten valued at one cent per lb.	Amount of roots and ensilage eaten at $2 per ton.	Amount of hay eaten at $7 per ton.	Number of months on pasture at $1 per month.	Total cost of feed for period.	Cost to produce 100 lbs. milk.	Cost to produce 1 lb. butter, skim milk neglected.	Profit on 1 lb. butter, sk. milk neglected.	Profit on cow during period, labour neglected.
				lbs.	lbs.	%	lbs.	$ c.	$ c.	$ c.	lbs.	lbs.	lbs.	mos.	$ c.	$ c.	c.	c.	$ c.
AYRSHIRES.																			
Flavia	6	Jan. 5, '07	300	30·7	9,214	3·8	421·21	101 09	13 19	114 28	2,064	16,451	1,137	4	45 28	49·1	10·9	13·1	69 00
Jessie A.	14	Apl. 13, '07	256	29·2	7,486	4·	353·71	84 89	11 69	96 58	1,685	11,743	644	4	34 90	46·6	9·8	14·2	61 68
Maggie	12	Apl. 29, '07	316	27·5	8,697	3·8	395·09	93 92	12 45	106 27	2,240	16,156	1,137	4	47 01	54·	12·1	11·9	59 26
			290	29·1	8,466	3·86	390·33	93 30	12 44	105 71	1,996	14,783	972	4	42 39	49·9	10·9	13	63 31
CANADIANS.																			
Zamora	12	Oct. 21, '07	306	23·1	7,072	4·9	412·63	99 03	9 99	109 02	2,292	15,886	1,137	4	47 25	66·8	11·7	12·3	61 77
Fortune d'Oka	10	Mar. 4, '08	286	26·2	7,500	4·2	371·36	89 12	10 69	99 81	1,905	15,919	1,135	4	43 23	59·6	11·9	12·1	56 58
Poupée	5	Apl. 6, '07	336	22·3	7,505	4·	359·55	86 29	10 72	97 01	2,051	15,406	1,137	4	44 30	59·	12·6	11·6	52 71
			309	23·8	7,359	4·3	381·18	91 48	10 46	101 94	2,082	15,737	1,136	4	44 92	61·8	12·	12·	57 0
GUERNSEYS.																			
Itchen Lady	11	Jan. 13, '07	366	29·	7,648	4·7	427·30	102 55	10 83	113 38	2,035	16,211	1,137	4	45 00	58·8	10·5	13·5	68 38
Deanie	11	Jan. 1, '07	366	20·4	7,492	4·6	413·81	99 31	11 62	110 93	2,067	15,496	1,135	4	44 61	59·9	10·7	13·3	66 32
Wedgewood's Pearl	5	Feb. 6, '08	315	13·9	4,373	5·6	290·	69 60	9 81	79 41	1,566	14,950	1,137	4	38 80	88·7	13·4	10·6	40 61
			349	21·1	6,504	4·9	377·03	90 48	10 75	101 24	1,889	15,552	1,137	4	42 80	69·1	11·5	12·4	58 44

SHORTHORNS.

Ottawa Lass	6	May 12, '07	306	26·2	8,032	4·	380·51	91 32	11 49	102 81	2,044	15,326	1,047	4	43·99	54·7	11·8	12·2	58·82
Illuminata II	5	June 4, '07	325	22·1	7,184	3·7	313·66	75 26	10 39	85 56	2,031	16,066	1,047	4	44·61	6[illegible]·0	14·5	9·5	40·95
Ottawa Marchioness	5	May 23, '07	284	16·3	4,632	4·	221·23	53 09	6 67	59 76	1,687	16,061	1,137	4	41·37	89·3	18·7	5·3	18·39
			305	21·5	6,616	3·9	305·13	73 22	9 51	82 71	1,920	15,817	1,077	4	43·32	68·6	15·0	9·0	39·38

THREE GRADES.

Alma g. G	7	May 28, '07	285	26·5	7,561	4·8	428·61	102 86	11 70	114 56	1,999	16,211	1,137	4	44 63	·59	10·4	13·6	69 93
Queenie g. G	10	July 4, '07	277	16·4	4,534	6·4	344·29	86 63	6 28	92 91	1,525	15,291	1,137	4	38 97	85·8	11·3	12·7	53 94
Dolly	7	Mar. 19, '08	300	23·8	7,146	3·8	325·56	78 13	10 23	88 36	1,801	15,862	1,137	4	42 25	59·1	12 9	11·1	46 11
			287·3	22·2	6,413	5·	366·15	89 20	9 73	98 61	1,775	15,788	1,137	4	41 95	67·9	11·5	12·4	56 66

DAIRY COW RECORDS.

KEEPING RECORDS.

A very large number of dairy farmers continue to avail themselves of the offer made by this division to supply free of cost forms whereon to keep a record of the milk produced, each day or 1 day in each week, by each cow. This fact points to progress along right lines. It is only when one knows the individuals in ones herd that one can hope to improve the general quality of the herd.

The forms supplied are for week-long periods, as illustrated below, or for month-long periods, as may be preferred by the dairymen. In addition forms for summarizing the month's work as well as forms whereon to enter up the year's record are sent on application.

DAILY MILK RECORD.

Herd belonging to..
Post Office..
Record for week ending..

(This form supplied free by Live Stock Division, Central Experimental Farm, Ottawa. Ont.)

COWS.

Day.	Time.																	Total. for day.
Sunday..........	Morning......																	
	Evening......																	
Monday..........	Morning......																	
	Evening......																	
Tuesday..........	Morning......																	
	Evening......																	
Wednesday.......	Morning......																	
	Evening......																	
Thursday	Morning......																	
	Evening......																	
Friday............	Morning......																	
	Evening......																	
Saturday	Morning......																	
	Evening......																	
Total.......	Week																	

(Reverse)

CENTRAL EXPERIMENTAL FARM.

Wm. Saunders, Director. J. H. Grisdale, Live Stock and Agriculture.

MILK RECORDS.

1. The profitable dairy cow must give over 5,000 pounds of milk each year. To know the value of a cow, her total annual yield of milk must be known. The only way to know this is to keep a record of her daily milk yield.

2. The form on the other side of this sheet is intended to help progressive dairy farmers by supplying them with a simple and convenient sheet for the keeping of the milk records of their individual cows. A study of such records will soon indicate which cows should go to the butcher. We would be pleased to receive a summary of your record. If you have no summary forms, write us.

3. Such records are being kept by hundreds of successful dairymen to-day. Many of these men attribute their success to the keeping of such records. Why not give the thing a trial if you are a dairyman? It will increase your milk product. It will lighten your labour since your interest will be increased in your work, and 'interest lightens labour.' It will show you the unprofitable cow, the 'boarder.' You cannot get rid of her too quickly.

4. For weighing the milk a simple spring balance may be secured for from one and a half to four dollars. If your local dealer cannot supply you, write the undersigned for particulars. A small platform scale is fairly convenient, but we find the spring balance preferable.

5. Many farmers keep records of the amount of food fed to individual cows. If you would like to do so, sample forms would be sent free on writing to J. H. Grisdale, Agriculturist, Central Experimental Farm, Ottawa, Ont.

BEEF PRODUCTION.

Between 60 and 70 steers of various ages were fed for shorter or longer periods during the year. Some of the lines of experimental work followed were:—

1. Summer feeding,
2. Feeding frozen wheat,
3. Baby beef.

The feeds used were such as are within the reach of any farmer, were in fact for the most part the same as are used by many farmers in eastern Canada: Clover hay, corn ensilage, roots, bran, gluten, oil meal, oats, barley, &c. In one case of course frozen wheat was used, a feed of rather uncommon occurrence, but of very considerable value where it happens unfortunately to be available in merchantable quantities.

SUMMER FEEDING.

In June, 1907, a bunch of seven steers was taken over from the Veterinary Branch of the Department of Agriculture and put on the regular ration of corn ensilage, clover hay and meal. The particulars of the experiment given below show that where properly fed steers are likely to do as well on fairly heavy feed in summer as in winter.

SUMMER FEEDING.

Lot A.

Number of steers in lot		7
First weight, gross, June 21, 1907	lbs.	5,985
First weight, average	"	855
Finished weight, gross, December 17, 1907	"	8,875
Finished weight, average	"	1,268
Total gain in 178 days	"	2,890
Average gain per steer	"	413
Daily gain per steer	"	2·32
Daily gain per lot, 7 steers	"	16·24
Gross cost of feed		$164 71
Cost of 100 lbs. gain		5 70
Cost of steers: 5,985 lbs. at $3 per 100 lbs.		179 55
Total cost to produce beef, $179.55 + 164.71		344 26
Sold: 8,875 lbs. at $4.60 per 100 lbs., less 5 per cent		387 84
Profit on lot		43 58
Net profit per steer		6 23
Average buying price per steer		25 65
Average selling price per steer		53 98
Average increase in value		28 33
Average cost of feed per steer		23 53
Amount of meal eaten by lot of 7 steers	lbs.	6,869
Amount of ensilage and roots	"	72,765
Amount of hay	"	2,835

Meal mixture consisted of corn, bran, gluten and oilmeal, in the approximate proportions of corn 3, gluten 5, bran 4, and oilmeal 1.

FEEDING FROZEN WHEAT TO STEERS.

The particulars of the experiments in feeding frozen wheat to steers are submitted below. The wheat fed was purchased from a farmer at Indian Head, Sask., in November, 1907. In the carload bought were two grades, No. 1 Frozen or Feed Wheat, and No. 2 Frozen or Feed Wheat. The first grade cost landed at Ottawa, $1.06 per 100 lbs., and the second grade cost 98 cents per 100 lbs. Ottawa. The first or more expensive grade was used for feeding steers. It was found necessary to grind the wheat very finely to secure the best results. Where it was not ground very finely it was not perfectly digested.

The check lot in the experiments was fed on bran and gluten as meal ration.

The wheat-fed lots received bran or oats along with the frozen wheat.

The grain or meal ration in each case consisted on the average of the following:—

Lot 'B'—Frozen wheat No. 1, 2·5 lbs., crushed oats, 2 lbs.

Lot 'C'—Frozen wheat No. 1, 2·2 lbs., bran, 3·3 lbs.

Lot 'D'—Frozen wheat No. 1, 2·78 lbs., bran, 2·66 lbs.

Lot 'E'—Gluten, 2·5 lbs., bran, 3·17 lbs.

The roughage was the same in each case, ensilage, roots, clover and oat hay, oat straw.

Lot B.

Number of steers in lot		8
First weight, gross, December 24, 1907	lbs.	5,840
First weight, average	"	730
Finished weight, gross	"	7,048
Finished weight, average	"	881
Total gain in 70 days	"	1,208
Average gain per steer	"	151
Daily gain per steer	"	2·15
Daily gain per lot, 8 steers	"	17·20
Gross cost of feed		$76 25
Cost of 100 lbs. gain		6 31
Average cost of feed per steer		9 53
Amount of meal eaten by lot of 8 steers	lbs.	3,066
Amount of ensilage and roots	"	23,688
Amount of oat hay	"	2,485
Amount of hay	"	1,785
Amount of straw eaten	"	588

Meal consisted of—

Frozen wheat No. 1, at $1.06 per 100 lbs	lbs.	1,954
Oats at $1.50 per 100 lbs	"	1,112

Average daily ration per steer, with value of items:—

Corn ensilage	40	lbs.	4·0 cts.
Clover hay	3	"	1·0 "
Oat hay	4	"	1·3 "
Oat straw	5	"	1·2 "
Crushed oats	2	"	3·0 "
Frozen wheat No. 1	3·5	"	3·7 "
Total	57·5 lbs.		14·2 cts.

Cow Barn, Ottawa—Showing feed passage, mangers, drinking fountains and control tank at end of passage. Photo of Frank T. Shutt.

Cow Barn, Ottawa—Showing manure passage, gutters stands, stall divisions and stanchions.
6127 p. 64. Photo by Frank T. Shutt.

Cow Barn, Ottawa—Showing main passage arrangement of cattle, and relative levels of different passages. Photo by Frank T. Shutt.

Cow Barn, Ottawa—Showing fresh air intakes along floor and feed room doors at far end.
6127—p. 64. Photo by Frank T. Shutt.

Cow Barn, Ottawa—Row of Guernsey Cows. Photo by Frank T. Shutt.

Lot C.

Number of steers in lot		8
First weight, gross, December 24, 1907	lbs.	6,672
First weight, average	"	834
Finished weight, gross, March 3, 1908	"	8,008
Finished weight, average	"	1,001
Total gain in 70 days	"	1,336
Average gain per steer	"	167
Daily gain per steer	"	2·4
Daily gain per lot, 8 steers	"	19·2
Gross cost of feed		$73 56
Cost of 100 lbs. gain		5 50
Average cost of feed for steer		9 19
Amount of meal eaten by lot of 8 steers	lbs.	3,108
Amount of ensilage and roots	"	24,304
Amount of oat hay or mixed crop	"	1,708
Amount of hay	"	1,780
Amount of straw eaten	"	1,680

Meal consisted of—

Bran at $1.10 per 100 lbs	lbs.	1,845
Frozen wheat No. 1, at $1.06 per 100 lbs	"	1,265

Average daily ration for steer, with value of items:—

Corn ensilage	45 lbs.	4·5 cts.
Oat straw	6 "	1·5 "
Oat hay	3 "	1·0 "
Clover hay	3 "	1·0 "
Bran	3·3 "	3·6 "
Frozen wheat No. 1	2·2 "	2·3 "
Total ration	62·5 lbs.	13·9 cts.

Lot D.

Number of steers in lot		8
First weight, gross, December 24, 1907	lbs.	7,600
First weight, average, December 24, 1907	"	945
Finished weight, gross, March 3, 1908	"	8,720
Finished weight, average, March 3, 1908	"	1,090
Total gain in 70 days	"	1,160
Average gain per steer	"	145
Daily gain per steer	"	2·07
Daily gain per lot, 8 steers	"	16·56
Gross cost of feed		$72 93
Cost of 100 lbs. gain		6 28
Average cost of feed per steer		9 10
Amount of meal eaten by lot of 8 steers	lbs.	3,052
Amount of ensilage and roots		24,640
Amount of oat hay	"	1,708
Amount of hay	"	1,680
Amount of straw eaten	"	1,736

Meal consisted of—

Bran, at $1.10 per 100 lbs	lbs.	1,493
Frozen wheat No. 1 at $1.06 per 100 lbs	"	1,559

Average daily ration per steer with value of items:—

Corn ensilage	44	lbs.	4·4	cts.
Clover hay	3	"	1·0	"
Oat hay	3	"	1·0	"
Oat straw	6	"	1·5	"
Bran	2·66	"	2·92	"
Frozen wheat	2·78	"	2·94	"
Total ration	61·44	lbs.	13·76	cts.

Lot E.

Number of steers in lot		8
First weight, gross, December 24, 1907	lbs.	8,544
First weight, average	"	1,068
Finished weight, gross, March 3, 1908	"	10,064
Finished weight, average	"	1,258
Total gain in 70 days	"	1,520
Average gain per steer	"	190
Daily gain per steer	"	2·71
Daily gain per lot, 8 steers	"	21·68
Gross cost of feed		$81 10
Cost of 100 lbs. gain		5 33
Average cost of feed per steer		10 14
Amount of meal eaten by lot of 8 steers	lbs.	3,164
Amount of ensilage and roots	"	27,720
Amount of oat hay	"	1,820
Amount of clover hay	"	1,680
Amount of straw eaten	"	1,772
Meal consisted of—		
Bran at $1.10 per 100 lbs	lbs.	1,774
Gluten at $1.30 per 100 lbs	"	1,392

Average daily ration per steer, with values of items:—

Corn ensilage	50	lbs.	5·0	cts.
Straw	6·5	"	1·6	"
Oat hay	3	"	1·0	"
Clover hay	3	"	1·0	"
Gluten	2·5	"	3·25	"
Bran	3·17	"	3·48	"
Total ration	68·17	lbs.	15·33	cts.

BABY BEEF.

The experiments in feeding young beef are being continued. The first lots reported on below, calves dropped in 1906 differ from previous experiments in this, the full fattening ration, or heavily fed lot show a loss during the last few months on feed. This is due no doubt to the fact that they were, like all other cattle on the Central Experimental Farm, fed under very adverse conditions, last summer, on account of building operations. Further they were slaughtered for educational purposes at a time when beef was very low priced so that they brought a cent a pound less than might have been expected under normal conditions. In spite of these adverse circumstances, however, the result of the feeding of this lot taken from birth to block, shows a small profit as does likewise the limited growing ration lot of the same age. This latter lot, however, were not exposed to the same hardships as the heavily fed lot. The limited ration lot went to pasture during the summer, were fed under favourable circumstances and, being sold at a time when beef was high priced brought their full value.

HISTORY OF 1907-8 LIFE PERIOD OF CALVES DROPPED IN 1906.

Below are particulars of the feeding of the 1906 dropped lots from April 1, 1907, up to the time they went to the block.

BABY BEEF EXPERIMENTS.

Lot 1—Limited Growing Ration, Dropped 1906.

Number of steers in lot		6
First weight, gross, April 1, 1907		3,270
First weight, average, April 1, 1907	lbs.	545
Finished weight, gross, May 4, 1908	"	6,144
Finished weight, average, May 4, 1908	"	1,024
Total gain in 400 days	"	2,874
Average gain per steer	"	479
Daily gain per steer	"	1·20
Daily gain per lot, 6 steers	"	7·20
Gross cost of feed		$189 16
Cost of 100 lbs. gain		6 64
Valuation put on steers April 1, 1907		117 31
Total cost to produce beef, $117.31+$189.16		306 47
Sold, 6,144 lbs. at $5.50 per 100 lbs. less 5 per cent		321 03
Profit		14 56
Profit per steer		2 43
Average valuation per steer to start		19 55
Average selling price per steer		53 50
Average increase in value		33 95
Average cost of feed for steer		31 52
Amount of meal eaten by lot of 6 steers	lbs.	6,224
Amount of ensilage and roots	"	52,279
Amount of hay	"	4,857
Amount of oat hay	"	1,860
Amount of straw eaten	"	2,807

Meal consisted of: Bran, 971 lbs.; oats, 1,051 lbs.; gluten, 2,269 lbs.; corn, 63 lbs.; frozen wheat, 1,737 lbs.; cotton seed meal, 133 lbs.

Lot 2.—Full Fattening Ration Lot, dropped May, 1906.

Number of steers in lot		6
First weight, gross, April 1, 1907	lbs.	3,615
First weight, average, April 1, 1907	"	602
Finished weight, gross, January 25, 1908	"	6,300
Finished weight, average, January 25, 1908	"	1,050
Total gain in 300 days	"	2,685
Average gain per steer	"	447
Daily gain per steer	"	1·39
Daily gain per lot, 6 steers	"	8·34
Gross cost of feed		$167 26
Cost of 100 lbs. gain		6 23
Steers valued March 31, 1907, 3,615 lbs. at $4.50 per 100 lbs.		162 68
Total cost to produce beef, $162.68 + $167.26		339 94
Sold: 6 steers at $50 each nett		300 00
Estimated loss in 10 months		39 94
Estimated loss per steer in 10 months		6 66
Average valuation per steer to begin		27 11

Average selling price per steer		$50 00
Average increase in value		22 89
Average cost of feed per steer		27 88
Amount of meal eaten by lot of 6 steers	lbs.	8,250
Amount of ensilage and roots	"	53,973
Amount of hay	"	3,782
Amount of straw eaten	"	605
Amount of green clover	"	1,008

Meal consumed consisted of oats, 2,018 lbs.; bran, 3,088 lbs.; gluten, 927 lbs.; barley, 219 lbs.; corn, 786 lbs.; oilmeal, 1,212 lbs.

LIFE HISTORIES.

Below are summarized the experiments with calves dropped in 1906. All particulars from birth to block are enumerated.

BABY BEEF PRODUCTION.

Lot I.—Limited Growing Ration, dropped 1906.

Number of steers in lot		6
First weight, gross, May 4, 1906	lbs.	485
First weight, average, May 4, 1906	"	81
Finished weight, gross, May 4, 1908	"	6,144
Finished weight, average, May 4, 1908	"	1,024
Total gain in 731 days	"	5,659
Average gain per steer	"	943
Daily gain per steer	"	1·29
Daily gain per lot, 6 steers	"	7·74
Gross cost of feed		$276 47
Cost of 100 lbs. gain		4 88
Cost of steers, $5 each		30 00
Total cost to produce beef, $276.47 + $30		306 47
Sold, 6,144 lbs. at $5.50 per 100 lbs.: less 5 per cent		321 03
Profit		14 56
Net profit per steer		2 43
Average buying price per steer		5 00
Average selling price per steer		53 50
Average increase in value		48 50
Average cost of feed per steer		46 08
Amount of meal eaten by lot of 6 steers	lbs.	8,334½
Amount of ensilage and roots	"	79,789
Amount of hay	"	6,913
Amount of oat hay or mixed crop	"	1,860
Amount of straw eaten	"	2,807
Amount of skim milk	"	10,146

Pasture, 5 months each.

Meal consisted of: Bran, 1,800½ lbs.; oats, 1,786 lbs.; gluten, 2,269 lbs.; corn, 189 lbs.; barley, 273 lbs.; frozen wheat No. 1, 1,737 lbs.; cotton seed meal, 133 lbs.; mixed meal, 147 lbs. Each steer ate during the 731 days on feed, 300 lbs. bran, 298 lbs. oats, 378 lbs. gluten, 31 lbs. corn, 45½ lbs. barley, 289½ lbs. frozen wheat, 22 lbs. cotton seed meal, 24 lbs. mixed meal, 13,298 lbs, ensilage and roots, 1,152 lbs, hay, 310 lbs. mixed crop or oat hay, 468 lbs. oat straw, 1,691 lbs. skim milk, and 5 months on pasture.

BABY BEEF EXPERIMENTS.

Lot 2—Full Fattening Ration Lot, Dropped May, 1906.

Number of steers in lot		6
First weight, gross, May 4, 1906	lbs.	680
First weight, average, May 4, 1906	"	113½
Finished weight, gross, January 25, 1908	"	6,300
Finished weight, average, January 25, 1908	"	1,050
Total gain in 627 days	"	5,620
Average gain per steer	"	937
Daily gain per steer	"	1·49
Daily gain per lot, 6 steers	"	8·94
Gross cost of feed	$	260 50
Cost of 100 lbs. gain		4 63
Cost of steers, $5 each		30 00
Total cost to produce beef, $30+$260.50		290 50
Sold, 6 steers at $50 each		300 00
Profit		9 50
Net profit per steer		1 58
Average buying price per steer		5 00
Average selling price per steer		50 00
Average increase in value		45 00
Average cost of feed for steer		43 41
Amount of meal eaten by lot of 6 steers	lbs	12,807
Amount of ensilage and roots	"	83,541
Amount of hay	"	5,738
Amount of skim milk	"	10,314
Amount of green clover	"	1,008

Meal consumed consisted of: Oats, 3,572 lbs.; bran, 5,356 lbs.; gluten, 927 lbs.; barley, 954 lbs.; corn, 786 lbs., and oil meal, 1,212 lbs. Each steer ate during the 627 days on feed 595 lbs. oats, 893 lbs. bran, 154½ lbs. gluten, 159 lbs. barley, 131 lbs. corn, 202 lbs. oil meal, 13,923 lbs. ensilage and roots, 956 lbs. hay, 1,719 lbs. skim milk and 168 lbs. green clover.

CALVES DROPPED IN 1907.

The calves secured in May, 1907, were an average lot and have done fairly well. They, like the previous lot, suffered during the summer 1907 from poor accommodation and disturbance on account of building operations going on all around them.

STEER CALF EXPERIMENTS.

Lot 1—Limited Ration Lot, Dropped, 1907.

Number of steers in lot		5
First weight, gross, May 1, 1907	lbs.	420
First weight, average, May 1, 1907	"	84
Finished weight, gross, March 31, 1908	"	2,520
Finished weight, average, March 31, 1908	"	504
Total gain in 336 days	"	2,100
Average gain per steer	"	425
Daily gain per steer	"	1·26
Daily gain per lot, 5 steers	"	6·30
Gross cost of food	$	75 04
Cost of 100 lbs. gain		3 57
Cost of steers, $5 each		25 00

Cost to feed 1 steer 1 day		$ 4 47
Total cost to bring steers to end of year		100 04
Steers worth to-day about		100 00
Profit or loss		Nil.
Net profit per steer		Nil.
Average buying price per steer		5 00
Average value per steer		20 00
Average increase in value		15 00
Average cost of feed for steer		15 01
Amount of skim milk consumed by lot 5 steers	lbs.	8,605
Amount of meal eaten by lot of 5 steers	"	2150·7
Amount of ensilage	"	21,140
Amount of roots	"	3,710
Amount of hay	"	3,030
Amount of straw eaten	"	1,120

Meal consisted of oats, 563·2 lbs.; oil meal, 290 lbs.; bran, 965·5 lbs.; gluten, 177 lbs.; corn, 155 lbs.

STEER CALF EXPERIMENTS.

Lot 2.—Full Fattening Ration, dropped 1907.

Number of steers in lot		6
First weight, gross, May 1, 1907	lbs.	640
First weight, average, May 1, 1907	"	106
Finished weight, gross, March 31, 1908	"	3,560
Finished weight, average, March 31, 1908	"	593
Total gain in 336 days	"	2,920
Average gain per steer	"	487
Daily gain per steer	"	1·45
Daily gain per lot, 6 steers	"	8·70
Gross cost of feed		$110 39
Cost of 100 lbs. gain		3 78
Cost of steers, $5 each		30 00
Cost to feed 1 steer 1 day		5 47
Total cost to bring steers to end of year		140 39
Steers worth to-day about		180 00
Profit or loss, about		40 00
Profit per steer about		7 00
Average buying price per steer		5 00
Average value per steer		30 00
Average increase in value		25 00
Average cost of feed for steer		18 40
Amount of skim milk consumed by lot 6 steers	lbs.	9,828
Amount of meal	"	4,009
Amount of roots	"	5,796
Amount of ensilage	"	28,518
Amount of hay	"	3,491
Amount of straw	"	1,522

Meal consisted of, oats, 679 lbs.; oilmeal, 338 lbs.; bran, 1796·5 lbs.; gluten, 838:5 lbs.; corn, 357 lbs.

SWINE.

During the year a large number of swine have been bred and fed. The results have been fairly satisfactory. Prices for feeds having been very high and pork prices low, financial results have not been quite as good as would have been liked.

In spite of high feed prices, however, it has been found possible to produce pork

at a profit where advantage was taken of cheapest feeds and most successful methods of feeding.

FEEDING SOWS.

In feeding breeding stock of all description the aim of the breeder should be to (1) keep the animal in good health, to (2) supply the animal with such food as contains in correct proportions and sufficient quantities the elements which enter into the upbuilding of the animal frame, and to (3) feed as cheaply as possible.

With breeding stock the chief troubles are likely to arise from indigestion, hence easily digested foods should be supplied. Since bone, muscle and viscera are the chief parts being developed, and since these require material rich in protein and mineral elements whereon to thrive, it is evident that food rich in these constituents should be chosen. On our Canadian farms no feeds grow more freely nor are produced more cheaply than roots and clover; oats are most widely grown, while wheat—bran and shorts, probably as cheap feeeds as any known, are produced here in immense quantities.

A most fortunate coincidence for Canadian farmers is this, that while roots, clover, alfalfa, oats, bran and shorts are at one and the same time our most wholesome, most plentiful, most digestible and most easily produced feeds, they are likewise the feeds wherein the elements required for bone and flesh upbuilding occur in the most available form and in the best balanced proportions.

As illustrative of the above remarks, there is submitted below a record of the feeding of 29 brood sows from December 1, 1907, to March 14, 1908.

These sows began to farrow about the middle of March, and without a single exception gave good litters of young pigs that came strong and lively.

FEED REPORT.

Amount of Feed consumed by 29 Brood Sows from December 1, 1907, up to March 14, 1908.

Week ending.	Roots.	Bran.	Shorts.	Clove r hay.
	lbs.	lbs.	lbs.	lbs.
December 7	2,600	300	....	50
" 14	2,600	300	....	50
" 21	2,650	250	....	100
" 28	2,650	250	....	100
January 4	2,700	200	....	100
" 11	2,700	200	....	100
" 18	2,700	200	....	100
" 25	2,100	140	280	150
February 1	2,450	150	300	150
" 8	2,450	238	476	150
" 15	2,450	238	476	100
" 22	2,400	300	575	100
" 29	2,250	336	672	100
March 7	2,200	350	700	100
" 14	2,200	336	672	100
	37,100	3,788	4,151	1,550

Cost to feed 29 brood sows for 105 days—

37,100 lbs. roots at $2 per ton =	$ 37 10
3,788 " bran at $22 " =	41 66
4,151 " shorts at $25 " =	51 81
1,550 " hay at $7 " =	5 42
	$ 135 99

105 days cost per pig per diem, 4·46 cts. 1st 7 wks. or 49 days cost per diem, 2·77 cts.

FROZEN WHEAT.

As mentioned elsewhere a carload of frozen wheat was brought in from Indian Head. This wheat was of two grades, Frozen No. 1 and Frozen No. 2.

Wheat Frozen No. 1 cost landed here $1.06 per 100 lbs.

Wheat Frozen No. 2 cost landed here 98 cts. per 100 lbs.

A somewhat extensive experiment conducted to gain some information as to its feeding value for pigs was carried on for 13 weeks with 68 pigs of different ages and of several breeds.

The pigs were divided into 12 groups of 5 each and 2 groups of 4 each. These groups were fairly uniform as to size of individuals composing same. Where a group was lighter than the average, another group heavier than the average was put on the same ration, so balancing things up.

The different rations fed were as follows:—

First period of three weeks (21 days) all pigs received what they would eat of the following which might be called our 'standard ration: 500 lbs. shorts, 200 lbs. corn (ground), 100 lbs. Imperial (coarse feed flour), roots equal parts by weight with meal fed, 2 lbs. skim milk per pig per diem.

Second period of one week (7 days)—

Different lots of pigs were put on the rations whereon they were to be fed during the main period of experiment. In making such a complete change of feed as was thus entailed, more or less derangement is certain, hence the pigs were allowed a week wherein to settle down to the new rations.

Third period of 8 weeks (56 days)—

10 pigs—Frozen wheat No. 1, 200 lbs.
Shorts, 100 lbs.

5 pigs—Frozen wheat No. 2, 200 lbs.
Corn (ground), 100 lbs.

9 pigs—Frozen wheat No. 2.

5 pigs—Frozen wheat No. 2, 200 lbs.
Barley (ground), 100 lbs.

10 pigs—Frozen wheat No. 1, 100 lbs.
Oats (ground), 100 lbs.

5 pigs—Frozen wheat No. 2
Skim milk, three pounds per pig per diem.

10 pigs—Frozen wheat No. 1.

4 pigs—Frozen wheat No. 1, 100 lbs.
Frozen wheat No. 2, 100 lbs.
Corn (ground), 100 lbs.

10 pigs—Shorts, 500 lbs.
Corn (ground), 200 lbs.
Imperial (coarse feed flour), 100 lbs.
Pulped roots (mangels) equal parts by weight with meal fed.
Skim milk, 2 lbs. per day per pig.

Fourth period of one week (7 days)

All pigs received what they would eat of standard ration as described above.

The tables below give full particulars as to weights of pigs, feed consumed, gains and cost of gains. Slaughter test report is not given on account of all pigs not being ready for block when coming off experiment.

The wheat was finely ground in every case. According to report of analysis made by Mr. F. T. Shutt, January 8, 1908, composition of these wheats was as follows:—

	Frozen wheat No. 1.	Frozen wheat No. 2.
Moisture	14·25	13·36
Protein or albuminoids	11·49	13·96
Fat	2·17	2·39
Carbohydrates	67·38	64·93
Fibre	2·85	3·29
Ash	1·86	2·07
	100·00	100·00

FROZEN WHEAT.—PIG FEEDING EXPERIMENT.

PRELIMINARY FEEDING, 21 DAYS.

Number of pigs in pen.	Weight per pen at commencement.	Average weight per pig.	Weight per pen at end.	Average weight per pig at end.	Gain per pen in 21 days.	Average gain per pig in 21 days.	Average gain per pig per day.	Total amount of meal consumed.	*Amount of meal for 1 lb. gain live weight.	Total cost of ration, roots and milk included.	Cost for 1 lb. gain live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	Cts.	
2 Lots { 5	370½	74·1	477	95·4	106½	21·3	1·01	240	2·2	3 60	3·3	500 lbs. shorts. 200 lbs. corn, 100 lbs. Imperial flour. Roots equal parts by weight with meal. Skim milk 2 lbs. per pig per day.
{ 5	297	59·4	371½	74·3	74½	14·9	·70	228	3·0	3 38	4·2	
Total, 10	667½	66·7	848½	84·8	181	18·1	·86	468	2·5	6 98	3·8	
1 Lot, 5	487	97·4	616	123·2	129	25·8	1·22	315	2·4	6 66	3·6	
2 Lots { 4	486	121·5	573	143·2	87	21·7	1·03	300	3·5	4 53	5·2	
{ 5	320	64·0	419	83·8	99	19·8	·94	225	2·2	3 35	3·3	
Total, 9	806	89·5	992	110·2	186	20·6	·98	525	2·8	7 88	4·2	
1 Lot, 5	392	78·4	489	97·8	97	19·4	·92	310	3·1	4 59	4·7	
2 Lots { 5	443	88·6	551½	110·3	108½	21·7	1·03	309	2·8	4 57	4·2	
{ 5	285	57·0	354½	70·9	69½	13·9	·66	214	3·1	3 19	4·5	
Total, 10	728	72·8	906	90·6	178	17·8	·84	523	2·9	7 76	4·3	
1 Lot, 5	367	73·4	461	92·2	94	18·8	·89	270	2·8	4 01	4·2	
2 Lots { 5	641	128·2	760½	152·1	119½	23·9	1·13	306	2·5	4 53	3·7	
{ 5	385	77·0	478	95·6	93	18·6	·88	246	2·6	3 67	3·9	
Total, 10	1026	102·6	1238½	123·8	212½	21·2	1·00	552	2·5	3 20	3·8	
1 Lot, 4	363	90·7	484½	121·1	421½	30·3	1·44	276	2·2	4 07	3·3	
2 Lots { 5	407½	81·5	515	103·	107½	21·5	1·02	266	2·4	3 95	3·6	
{ 5	313	62·6	379½	75·9	66½	13·3	·63	222	3·3	3 31	4·9	
Total, 10	720½	72	894½	89·4	174	17·4	·82	488	2·8	7 26	4·1	

* Roots equal parts with meal. Skim milk, 2 lbs. per day per pig, in addition to above amount.

FROZEN WHEAT—PIG FEEDING EXPERIMENT.

CHANGE PERIOD 7 DAYS.

Number of pigs in pen.	Weight per pen at commencement of change period.	Average weight per pig.	Weight per pen at end of change period.	Average weight per pig at end of change period.	Gain or loss per pen in 7 days.	Average gain or loss per pig in 7 days.	Average gain or loss per pig per day.	Total amount of meal consumed.	Amount of meal for 1 lb. gain.	Total cost of Rations.	Cost of meal for 1 lb. gain.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	Cts.	
2 Lots.. { 5	447	95·4	495½	99·1	18½	3·7	·52	106	5·7	1·18	6·3	200 lbs. frozen wheat No. 1
5	371½	74·3	380	76·0	8½	1·7	·24	86	10·1	·96	11·6	100 lbs. shorts.
Total, 10	848½	84·8	875½	87·5	27	2·7	·38	192	7·1	2·14	7·9	
1 Lot, 5	616	123·2	591	118·2	*25	*5·0	* ·71	112	......	1·29	......	200 lbs. frozen wheat No. 2. 100 lbs. corn.
1 Lots.. { 4	573	143·2	560	140·0	*13	*3·2	* ·45	100	......	·98	......	
5	419	83·8	425½	106·2	6½	1·3	·18	72	11·0	·70	10·7	Pure frozen wheat No. 2.
Total, 9	992	110·2	985½	109·5	* 6½	* ·7	·10	172	......	1·68	......	
2 Lot, 5	489	97·8	520½	104·1	31½	6·3	·90	102	3·2	1·08	3·4	200 lbs. frozen wheat No. 2. 100 lbs. barley.
2 Lots.. { 5	551½	110·3	560½	112·1	9	1·8	·25	106	11·7	1·18	13·0	200 lbs. frozen wheat No. 1
5	354½	70·9	371	74·2	17½	3·5	·50	80	4·5	·96	5·4	100 lbs. oats.
Total, 10	906	90·6	931½	93·1	26½	2·6	·37	186	7·0	2·14	8·0	
1 Lot, 5	461	92·2	495	99·0	34	6·8	·97	102	3·0	1·14	3·3	Frozen wheat Grade 2 Skim milk, 3 lbs. per day per pig.
2 Lots.. { 5	760½	152·1	752	150·4	* 8½	*1·7	* ·24	112	......	1·18	......	
5	478	95·6	481½	96·3	3½	·7	·10	82	23·4	·86	24·5	Pure frozen wheat No. 1
Total, 10	1,238½	123·8	1,233½	123·3	* 5	* ·5	* ·07	194	......	2·04	......	
1 Lot, 4	484½	121·1	489½	122·3	5	1·2	·17	112	22·4	1·31	26·2	100 lbs. frozen wheat No. 1. 100 lbs. frozen wheat No. 2. 100 lbs. corn.
2 Lots.. { 5	515	103·0	543	108·6	28	5·6	·80	102	3·6	1·59	5·3	500 lbs. shorts. 200 lbs. corn. 100 lbs. Imp. flour skim milk 2 lb. per day per pig. Roots equal parts by weight with meal.
5	379½	75·9	419	83·8	39½	7·9	1·12	80	2·0	1·27	3·2	
Total, 10	894½	89·4	962	96·2	67½	6·7	·95	182	2·7	2·76	4·1	

* Loss marked.

FROZEN WHEAT.—PIG FEEDING EXPERIMENT.

MAIN PERIOD 56 DAYS.

Number of pigs in pen.	Weight per pen at commencement.	Average weight per pig.	Weight per pen at finish of.	Average weight per pig.	Gain per pen in 56 days.	Average gain per pig.	Average gain per pig per day.	Total amount of meal consumed.	Amount of meal for 1 lb. gain live weight.	Total cost of rations.	Cost for 1 lb. gain live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	Cts.	
2 Lots { 5......	495½	99·1	709	141·8	213½	42·7	·76	851	3·9	9 53	4·4	200 lbs. frozen wheat No. 1
2 Lots { 5......	380	76·0	596	119·2	216	43·2	·77	814½	3·7	9 17	4·2	100 lbs. shorts.
Total, 10......	875½	87·5	1305	130·5	429½	42·9	·76	1665½	3·8	18 70	4·3	
1 Lot, 5......	591	118·2	881	176·2	290	58·0	1·03	1139½	3·9	13 14	4·5	{ 200 lbs. frozen wheat No. 2. 100 lbs. corn.
2 Lots { 4......	560	140·0	837	209·2	277	69·2	1·23	1021	3·6	10 00	3·6	
2 Lots { 5......	425	85·0	624	124·8	199	39·8	·71	763	3·8	7 47	3·7	Pure frozen wheat No. 2.
Total, 9......	985	109·4	1461	162·3	477	53·0	·94	1784	3·7	17 47	3·6	
1 Lot, 5......	520½	104·1	748	149·6	227½	45·5	·81	934½	4·1	9 98	4·3	{ 200 lbs. frozen wheat No. 2. 100 lbs. barley.
2 Lots { 5......	560½	112·1	847	169·4	286½	57·3	1·02	1129½	3·9	13 62	4·7	200 lbs. frozen wheat No. 1
2 Lots { 5......	371	74·2	558	111·6	187	37·4	·66	724½	3·9	8 74	4·6	100 lbs. oats.
Total, 10......	931½	93·1	1405	140·5	473½	47·3	·83	1854	3·9	22 36	4·7	
1 Lot, 5......	495	99·0	736	147·2	241	48·2	·86	822	3·4	9 20	3·8	{ Pure frozen wheat No. 2. Skim milk, 3 lbs. per pig per day.
2 Lots { 5......	752	150·4	1016	203·2	264	52·8	·94	1097½	4·1	11 63	4·4	
2 Lots { 5......	481½	96·3	704	140·8	222½	44·5	·79	882½	3·9	9 35	4·2	Pure frozen wheat No. 1.
Total, 10......	1233½	123·3	1720	172·0	486½	48·6	·86	1980	4·0	20 98	4·3	
1 Lot, 4......	499½	124·8	707	176·7	207½	51·8	·94	987	4·7	11 63	5·6	{ 100 lbs. frozen wheat No. 1. 100 lbs. frozen wheat No. 2. 100 lbs. corn.
2 Lots { 5......	543	108·6	796½	159·3	253½	50·7	·90	855½	3·3	13 29	5·1	{ 500 lbs. shorts. 200 lbs.
2 Lots { 5......	419	83·8	686	137·2	267	53·4	·95	814	3·0	12 61	4·6	corn. 100 lbs. Imp. flour
Total, 10......	962	96·2	1482½	148·2	520½	52·0	·92	1669½	*3·2	25 90	4·8	2 lbs skim milk per pig per day. Roots equal parts by weight with meal.

* Roots and milk besides.

PIG FEEDING EXPERIMENT.

FINISHING PERIOD, 7 DAYS.

Number of Pigs in pen.	Weight per pen at commencement.	Average weight per pig.	Weight per pen at end.	Average weight per pig at end.	Gain per pen in 7 days.	Average gain per pig in 7 days.	Average gain per pig per day.	Total amount of meal consumed.	Amount of meal for 1 lb. gain live weight	Total cost of ration, including Roots and Milk.	Cost to produce 1 lb. gain live weight.	Ration.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	Cts.	
2 Lots { 5	709	141·8	741	148·2	32	6·4	·91	77	2·4	1 20	3·7	500 lbs. shorts, 200 lbs. corn, 100 lbs. Imperial flour. Skim milk 2 lbs. per day per pig. Roots equal parts by weight with meal.
{ 5	596	119·2	636	127·2	40	8·0	1·14	86	2·1	1 34	3·3	
Total, 10	1,305	130·5	1,377	137·7	72	7·2	1·02	163	2·2	2 54	3·5	
1 Lot, 5	881	176·2	922	184·4	41	8·2	1·17	109	2·6	1 67	4·0	
2 Lots { 4	837	209·2	861	215·2	24	6·0	·85	102	4·2	1 57	6·5	
{ 5	624	124·8	656	131·2	32	6·4	·91	82	2·5	1 28	4·0	
Total, 9	1,461	162·3	1,517	168·5	56	6·2	·88	184	3·2	2 85	5·0	
1 Lot, 5	748	149·6	794	158·8	46	9·2	1·31	105	2·2	1 61	3·5	
2 Lots { 5	847	169·4	867	173·4	20	4·0	·57	103	5·1	1 58	7·9	
{ 5	558	111·6	586	117·2	28	5·6	·80	78½	2·8	1 22	4·3	
Total, 10	1,405	140·5	1,453	145·3	48	4·8	·68	181½	3·7	2 80	5·8	
1 Lot, 5	736	147·2	745	148·6	9	9·8	·25	84	9·3	1 31	14·5	
2 Lots { 5	1,016	203·2	1,056	211·2	40	8·0	1·14	105	2·6	1 61	4·0	
{ 5	704	140·8	732	146·4	28	5·6	·80	96	3·4	1 39	4·9	
Total, 10	1,720	172·0	1,788	178·8	68	6·8	·97	201	2·8	3 09	4·5	
1 Lot, 4	707	176·7	738	184·5	31	7·7	1·10	73	2·3	1 15	3·7	
2 Lots { 5	796½	159·3	831	166·2	34½	6·9	·98	110	3·1	1 68	4·8	
{ 5	686	137·2	713	142·6	27	5·4	·77	101	3·7	1 53	5·6	
Total, 10	1,482½	148·2	1,544	154·4	61½	6·1	·87	211	3·4	3 21	5·2	

* Roots and skim milk in addition to above figures.

LIVE STOCK INVENTORIES.

Below are submitted inventories and returns from the various classes of live stock under my charge during the year from April 1, 1907 to March 31, 1908.

Class.	April 1st, 1907.		April 1st, 1908.		Returns.	Gross returns made up of increase in value, value of products and value of animals sold.
	No.	Value.	No.	Value.	Value.	
		$ cts.		$ cts.	$ cts.	$ cts.
Horses	19	....	19	....	3,922 92	3,922 92
Breeding Cattle	90	10,560 00	95	12,125 00	4,889 35	6,454 35
Steers	33	1,502 40	43	2,005 60	1,538 31	2,041 51
Sheep	26	490 00	42	584 00	167 17	261 17
Swine	220	2,437 00	199	2,426 00	2,318 43	2,307 43
Total	388	14,989 40	396	17,140 60	12,836 18	14,987 38

SUMMARY OF LIVE STOCK OPERATIONS.

RETURNS.

Gross returns from animals of all classes, including value of products, values of services and increases in value of young stock	$14,987 38
Manure, 1,400 tons	1,400 00
Total	$16,387 38

EXPENDITURE.

Value of Food Consumed.

Meal, grain, &c		$ 6,307 62
Hay		1,414 00
Roots and ensilage		1,519 77
Whole milk, 18,000 lbs		180 00
Skim milk, 200,000 lbs		300 00
Straw, 146 tons at $4 per ton		584 00
Cost of labour in connection with care of horses, cattle, sheep and swine:—		
Herdsman	$ 750 00	
One man	600 00	
Three men at $528	1,584 00	
Two men at $500	1,000 00	
Extra help, teaming, &c	230 00	
	$4,164 00	4,164 00
Total expenditure		$14,469 39
Balance		$1,917 99

Summary of Farming and Live Stock Operations on '200-Acre Farm,' 1907.

RETURNS.

Total value of returns from fields	$ 3,902 33
Total value of returns from live stock	16,387 38
Total returns	$20,289 71

EXPENDITURE.

Total cost of field operations (see pages 82-90)	$ 2,465 91
Total cost of live stock operations (see page 78)	14,469 39
Total expenditure	$16,935 30
Balance	$3,354 41

COMPARATIVE Statement of Crops on '200 Acre Farm,' from 1899 to 1907, inclusive. (200 Acre Farm includes 7 Acres of Roads.)

Year.	Grain. Area in Acres.	Grain. Yield in Pounds.	Hay. Area in Acres.	Hay. Yield in Tons.	Roots and Corn. Area in Acres.	Roots and Corn. Yield in Tons.	Pasture. Area in Acres.	Pasture. Number of Cattle.	Soiling Crop. Area in Acres.	Soiling Crop. Disposition of Crops.	Pig Pasture. Area in Acres.	Pig Pasture. Crops Grown for Pasture.	Remarks.
1899	73	118,466	39	93	40	326½	40	36	1	Fed to dairy cows	...	.....	Generally considered a good year for all crops.
1900	80	126,621	53	138	40	743	20 and aftermath.	49	....	....	....	....	Season very favourable for most crops.
1901	79	114,472	58	210	40	702	16 and aftermath.	52	....	....	....	....	" " "
1902	74	144,914	60	216	39	665	20 and aftermath.	62	...	....	5	Clover, rape and aftermath.	Season favourable for hay, bad for corn.
1903	69	126,619	62	154	34	473	16 and aftermath.	96	5	Dairy cows, bulls and calves.	6	Clover and rape.	Season very unfavourable for most crops, particularly adverse to corn and roots. No second crop hay.
1904	67	112,009	60	192	46¾	674	13·75	98	3	" " ..	3	" " ..	Season unfavourable for grain and corn, good for hay and roots.
1905	66	111,932	59	258	47	971½	14 and aftermath.	100	5	All cattle ensilage fed.	4	Clover, rape, mixed crop, pease, roots.	Season favourable for hay, corn and roots, too wet for grain on mucky land.
1906	69	125,516	62	140	48	774½	14	105	5	" " ..	3	" " ..	Very bad season. Meadows winter killed. Summer too dry.
1907	61	102,494	73	227	46	704	13·75	110	5	" " ..	3	" " ..	Bad hay year. Grain fair. Corn and roots poor.

Of the area indicated as having been used as pasture for swine in 1895, 3 acres yielded a crop of green feed for soiling cattle before being given over to swine. Cattle were pastured on roads where possible. A small rough field not included in the '200 Acre Farm' is used as partial pasture and a run for about 20 head of young stock. These cattle receive ensilage or other succulent food every day, and meal at the rate of about 1½ lbs. each per day part of the time.

The variety of crops grown and the varying areas under each crop each year make it quite difficult to make a comparison of the returns of the different years, so to simplify matters I would suggest that a fixed valuation be put upon the products, and the returns of each year valued accordingly.

Fixing prices as follows: Grain, $1 per hundred lbs.; roots and ensilage, $2 per ton; hay, $7 per ton; summering cattle, $8 per season; and an area used as pasture for pigs, $15 per acre; the returns from the '200-acre farm' for the years mentioned may be said to have been worth $2,776.66 in 1899; $4,110.21 in 1900; $4,434.72 in 1901; $4,787.14 in 1902; $4,148.19 in 1903; $4,741.09 in 1904; $5,714.32 in 1905; $4,669.16 in 1906, and $4,931.94 in 1907.

ROTATION EXPERIMENT.

The experiment to determine the effects of different rotations is being followed up, and under the detailed report of the labour on each plot, and in the return therefrom will be found some brief notes on each field and on the rotation as a whole.

The rotations are as follows:—

Rotation A.—Five years, clover hay, timothy hay, grain, corn, grain.

Rotation B.—Five years, clover hay, grain, clover hay, corn, grain.

Rotation E.—Three years, pasture, corn, grain.

Rotation Z.—Three years, clover hay, corn, grain.

Rotation S.—Four years, shallow ploughing, clover hay, timothy hay, roots, grain.

Rotation D.—Four years, deep ploughing, clover hay, timothy hay, roots, grain.

Rotation H.—Three years, hog pasture, roots, grain or soiling crop.

Rotation T.—Four years, sheep pasture, roots and soiling crop, grain, clover hay.

In the descriptions of the rotations and fields that follow, an effort is made to give as concisely as possible the location of each field, its size, the character of its soil, its drainage and its general crop history.

In the tables will be found all items of expenditure. The manure is applied in the same ratio to each field in each rotation. To illustrate: if to the corn land in rotation 'Z,' 15 tons of manure per acre is applied; this is equivalent to 5 tons per acre per annum, as Z, is a three-year rotation. Then in applying manure to B, 25 tons per acre would be applied, as B is a five-year rotation. Since the manure must vary slightly in quantity each year, $3 per annum per acre is charged in each rotation.

COMPARATIVE VALUES OF ROTATION ON STOCK FARMS.

Supposing the average animal of the bovine species to consume 2,000 lbs. hay, 1,500 lbs. meal, 16,000 lbs. roots and ensilage and 2,000 lbs. of straw per annum, which valued at prices given above would amount to $37, a rough idea of the relative value of the different rotations for stockmen may be arrived at.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	Crops. 1906.	1907.	Rent and Manure.	Seed, Twine and use of Machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
A 1........	W.S. 3......	30	45	...	....	25	....	....	9·96	Corn	Grain	59 76	15 98
A 2.... ..	L.S. 1 ...	30	65	5	....	....	...	...	8·90	Grain	Corn	53 40	11 57
A 3........	A.S. 14...	10	15	20	20	15	..	20	10·20	Grain	Hay.......	61 20	13 26
A 4......	W.P.G.S. 1. F.S. 1.. . .	70	20	10	....	..	....	....	9·15	Hay.........	Grain	54 90	14 54
A 5.. . ..	F.S. 3......	....	35	30	10	15	10	...	9·63	Hay........	Hay........	57 78	12 52
	Aggregate								47·84			287 04	67 87
	Average per acre in 1907.................								1·00			6 00	1 41
	Average for 4 years								....			6 00	1 64

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in Acres.	1906.	1907.	Rent and Manure.	Seed, Twine and use of Machinery.
B 1	W.S. 4.....	5	35	5	50	5	....	...	10 00	Hay........	Grain	60 00	15 88
B 2........	L.S. 2......	20	70	...	5	5	....	...	8 82	Hay... ...	Corn	52 92	11 46
B 3......	A.S 15	20	60	5	....	15	...	...	10 20	Corn	Grain ...	61 20	18 21
B 4	W.P.G.S. 2.	20	60	15	.. .	5	....	....	9 15	Oats........	Hay..	54 90	11 89
B 5........	F.S. 2	....	30	30	40	....	....	....	9 93	Oats........	Hay.......	59 58	12 91
	Aggregate								48 10			288 60	70 35
	Average per acre in 1907....								1 00			6 00	1 46
	Average for 4 years								......			6 00	1 53

ROTATION 'A.'

This rotation of 5 years duration includes grain, hay (2 years) grain and corn or roots in the order named. The grain crop mentioned first comes after corn. With the first crop of grain is sown 10 lbs. red clover, 1 lb. alsike, and 10 lbs. timothy per acre. The field is left in hay for 2 years, then in August of the second year, it is ploughed and cultivated at intervals till October, when it is ridged up and left till the next spring. Oats are sown on this field, and with them red clover seed, at the rate of 10 lbs. per acre. This clover is allowed to grow for something over a year or until corn seeding time the following spring when it is turned under with a shallow furrow along with the manure that will have been applied during the winter. After the corn has been harvested the land is ploughed shallow and left till the next spring. The crops on this rotation have been fairly satisfactory this year. On 'A,' a crop of oats was grown. Several varieties were sown and all yielded fairly well. On 'A 2' the crop grown was corn for ensilage. The summer being cool and dry the crop was light, and to make the showing still worse heavy frosts materially reduced the tonnage. 'A 3' and 'A 5' were both under hay and gave fair crops. The season being cold and dry only one crop was harvested off each field. 'A 4' was under grain, but gave a very light crop, on account of dry weather, a large part of 'A 4' is sandy soil.

'A.'

Items of Expenses in Raising Crop in 1907.								Particulars of Crop in 1907.						
Manual Labour.		Horse Labour.												
Hours Manual Labour.	Cost of Manual Labour.	Hours with Single Horse.	Hours with Team.	Value of Horse Labour.	Threshing.	Total Cost.	Cost for 1 Acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total Value.	Value of Crop per Acre.	Profit per Acre in 1907.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
46	7 66	4	104	32 20	13 57	129 17	12 96	16,027	29,313	... .	... ...	299 04	30 02	17 06
391	65 16	35	230½	77 90	.... ..	208 03	23 37	......	... .	....	245,090	245 09	27 54	4 17
81	13 50	20	64½	24 35	......	112 31	11 01	.. ..	.....	72,530	....	253 85	24 89	13 88
34	5 67	4	244	74 20	10 10	159 41	16 33	11,941	18,509	....	....	215 63	23 45	7 12
71	11 83	7	23	8 65	.....	90 78	9 43	...	......	51,710	....	180 99	18 80	9 37
623	103 82	70	666	217 30	23 67	699 70	73 10	27,968	47,822	124,240	245,090	1,194 60	124 70	51 60
13·02	2 17	1·4	13·92	4 54	0 49	14 63	14 63	584	999	2,597	5,123	24 97	24 94	10 32
19·98	2 98	7·74	9·18	4 82	0 29	15 21	.....	668	989	2,477	6,394	24 95	.....	9 76

'B.'

50	8 34	4	147	62 30	11 16	157 68	15 76	13,191	28,702	....	....	255 26	25 52	9 76
356	59 33	19	236¼	75 70	..	199 41	22 60	. ....	.	....	226,520	226 52	25 68	3 08
100	16 67	3½	156½	41 82	19 60	157 50	15 34	23,904	32,506	... ...	.. ..	423 57	41 52	26 08
89	14 83	10½	29	11 33	.....	92 95	10 15	....	... .	52,630	....	184 20	20 13	9 98
90	15 00	12	39½	14 85	.....	102 34	10 30	......	......	51,000	....	178 50	17 94	7 64
685	114 17	49	568½	206 00	30 76	709 88	74 15	37,095	61,208	103,630	226,520	1,268 05	130 79	56 54
14	2 37	1·0	11·84	4 28	0 64	14 83	...	771	1,272	2,154	4,079	26 34	... ...	11 31
20	3 00	8·4	7·51	4 61	0 35	15 62	.....	651	1,204	2,624	5,995	25 23	. .	9 56

ROTATION 'B.'

This rotation of five years' duration includes grain, hay, corn or roots, grain, hay in the order named. the first crop of grain following a crop of hay. Red clover 10 lbs., alsike 1 lb., and timothy 5 lbs. is sown with the grain each time the grain is sown. When grain follows hay the land is ploughed in the early fall. When corn follows hay the land is ploughed in the spring, the spring growth of grass and clover being ploughed in along with the manure, which will have been applied during the preceding winter.

The crops on this rotation were fairly satisfactory, with the exception of the grain crop on 'B1.' A large part of 'B1' consists of black muck, and the grain crops did not do well thereon this year. On 'B2' the corn suffered from the cold, dry summer, and was later frozen, so that tonnage is light. Off 'B3' was harvested an excellent crop of grain, Banner oats. 'B4' and 'B5' each gave a fair crop of hay.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1906.	1907.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c-	p. c.	p. c.	Ac.	1906.	1907.	$ cts.	$ cts.
D. 1.......	E.G.P.S. 2..	20	80	....	.....	....	....	....	2	Hay......	Roots ..	12 00	2 60
D. 2......	E.G.P.S. 4..	20	80	....	.....	....	....	....	2	Roots	Grain	12 00	3 32
D. 3.......	E.G.P.S. 6..	30	70	....	.....	....	....	....	2	Grain	Hay......	12 00	2 60
D. 4.......	E.G.P.S. 8..	60	40	....	.....	....	....	....	2	Oat hay	"	12 00	2 60
	Aggregate......								8	....	....	48 00	11 12
	Average per acre in 1907..........								1	....	....	6 00	1 39
	Average for four years..........								......	....	....	6 00	1 24

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1906.	1907.	Rent and manure.	Seed, twine and use of machinery.
S. 1........	E.G.P.S. 1..	20	80	....	....	....	....	....	2	Tim. hay...	Roots	12 00	2 60
S. 2........	E.G.P.S. 3..	20	80	....	....	....	....	....	2	Roots	Grain	12 00	3 32
S. 3........	E.G.P.S. 5..	30	70	....	....	....	....	....	2	Grain	Hay........	12 00	2 60
S. 4........	E.G.P.S. 7..	60	40	....	....	....	....	....	2	Oat hay	"	12 00	2 60
	Aggregate..............								8	....	....	48 00	11 12
	Average per acre in 1907....								1	....	....	6 00	1 39
	Average for four years.......								.....	....	....	6 00	1 25

ROTATION 'D.'

Deep Ploughing.

This rotation is of four years' duration, and includes grain, two-years hay, roots. The grain crop follows roots, the root land being ploughed to a depth of about seven inches after the roots are harvested in the fall. With the grain is sown 10 lbs. red clover, 1 lb. alsike and 11 lbs. timothy seed per acre. The clover hay is cut twice in the season, and the second aftermath left on the field, that is, it is not pastured off as is usually done. In the second hay year two crops are cut if possible, and the land ploughed in August with a deep seven-inch furrow.

'D3' and 'D4.'—These two plots were under hay this year; they gave good crops.

'D1.'—This plot, like its fellow 'S1,' was under roots. The mangel seed came up badly, and it was necessary to resow with turnips. The cut worm attacked the plots.

'D2.'—This plot was under oats.

Owing to the very dry season the root crops on 'D1' was light, and shows a loss on work, &c.

'D.'

Items of Expense in raising Crop of 1907.								Particulars of Crop of 1907.						
Manual labour.		Horse labour.												
Hours.	Cost of Manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one Acre.	Grain.	Straw.	Hay.	Roots and Ensilage.	Total value.	Value of Crop per Acre.	Profit per Acre in 1907.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
284½	42 68	45	65½	30 90	......	88 18	44 69	.....	.....	......	72,670	72 67	36 33	* 7 76
9½	1 58	1	34½	10 60	2 47	29 97	14 98	2,679	4,811	....	....	49 84	24 92	9 94
24	4 00	5	7	3 35	......	21 95	10 97	. .	.....	13,480	....	46 82	23 41	12 44
25	4 17	5½	7	3 47	....	22 24	11 12	.....	....	14,28[illegible]	.. ...	49 98	24 99	13 87
343	52 43	56½	114	48 32	2 47	162 34	81 16	2,679	4,811	27,760	72,670	219 31	109 65	28 49
42	6 55	7	14	6 04	0 30	20 29	.....	334	601	3,470	9,083	27 41	.	7 12
42·7	7 77	8·3	10	5 35	0 20	20 61	.....	880	687	3,318	10,896	28 05	......	7 43
'S.'														
285	42 75	45	61	29 55	.... .	86 90	43 45	......	.....	....	74,450	74 45	37 23	* 6 22
9½	1 58	1	34½	10 60	2 47	29 97	14 98	2,679	4,811	....	....	49 84	24 92	9 94
24	4 00	5	7	3 35	.....	21 95	10 97	......	......	13,225	... .. .	46 28	23 14	12 17
25	4 17	5½	7	3 47	.. .	22 24	11 12	.. .	....	14,425	....	50 49	25 25	14 13
343½	52 59	56½	109½	46 97	2 47	161 06	80 52	2,679	4,811	27,650	74,450	221 06	110 54	30 02
42	6 56	7	13·6	5 87	0 30	20 13	.....	334	601	3,456	9,306	27 63	. ...	7 50
53·05	7 77	9 7	9·9	5 24	0 20	20 56	....	874	695	3,319	11,001	28 10	.. .	7 59

* Loss.

ROTATION 'S.'

Shallow Ploughing.

This rotation is of four years' duration, and includes grain, two-years hay, roots.

The grain crop follows roots, the root land being ploughed (or cultivated) to a depth of about four inches after the roots are harvested in the fall. With the grain is sown 10 lbs. red clover, 1 lb. alsike and 10 lbs. timothy seed per acre. The clover hay is cut twice in the season, and the second aftermath left on the field, that is it is not pastured off as is usually done. In the second hay year two crops are cut if possible, and the land ploughed in August with a shallow four-inch furrow. If manure is applied before ploughing, a subsoiler should be attached to plough to loosen up the subsoil to a depth of eight or nine inches. If manure is not applied this end is attained by means of a strong deep-reaching cultivator after the sod has rotted in the fall, or the next spring.

'S3' and 'S4.'—These two plots were under hay this year. They gave good crops.

'S1.'—This plot, like its fellow 'D1,' was under roots. The mangel seed came up badly, and it was necessary to resow with turnips.

'S2.'—This plot was under oats.

Owing to very dry season the root crops on 'S1' was light, and shows a loss on work, &c.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1906.	1907.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	Ac.			$ cts.	$ cts.
E. 1	W. S. 1	40	40	...	....	15	5	..	14·00	Pasture	Corn	84 00	18 20
E. 2	L. S. 4	10	60	...	10	20	....	....	13·75	Grain	Pasture	82 50	25 57
E. 3	Morn	30	60	5	....	...	...	....	14·00	Corn	Grain	84 00	23 60
	Aggregate								41·75			250 50	67 37
	Average per acre in 1907								1·00			6 00	1 61
	Average for four years											6 00	1 98

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1906.	1907.	Rent and manure.	Seed, twine and use of machinery.
Z. 1	W. S. 2	40	40	....	...	15	5	....	6·00	Hay	Corn	36 00	7 80
Z. 2	L. S. 3	10	60	10	...	20	....	...	5·81	Grain	Hay	34 86	7 55
Z. 3	Obs. S.	10	60	20	10	....	..	....	4·2	Corn	Grain	25 20	6 54
	Aggregate								16·01			96 06	21 89
	Average per acre in 1907								1·00			6 00	1 36
	Average for four years											6 00	1 59

ROTATION 'E.'

This rotation of three years duration includes grain, pasture and corn.

The grain comes after the corn, the stubble of which is treated as described under rotation 'A.' With the grain in the spring is sown 10 lbs. of red clover, 1 lb. alsike clover, 5 lbs. alfalfa and 5 lbs. timothy seed per acre. If weather permits the field is pastured slightly in the fall.

After the grain crop the land is pastured, the grass seeding having been done with this object in view. In estimating the value of the return from this field, pasture is charged at $1 per month per cow. At this rate the returns fall very far short of what would have been the returns if a hay crop had been harvested, if we may judge by the returns from 'Z2.' This rotation and rotation 'Z' were introduced into the list in order to gain some idea as to the difference in returns probable from land pastured and land from which all the crops are harvested. Of course the corn crop after the pasture has in a measure made up for the difference in favour of the no pasture rotation 'Z,' but the returns are on the whole, still considerably short of those from 'Z.'

Corn follows the pasture. Manure is applied during the fall and winter and turned under with the growth of clover and grass in the spring.

'E.'

Items of Expense in raising Crop in 1907.								Particulars of Crop in 1907.							
Manual Labour.		Horse Labour.													
No. of hours.	Cost of manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for one acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit, per acre, in 1907.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.
512	85 33	57	386	130 05	......	317 58	22 70	......	......	....	392,700	392 70	28 05	5 35
......	......	....	....	......	......	108 07	7 80	......	.....	....	....	120 00	8 60	0 80
100	16 67	5	172	52 85	20 45	197 57	14 11	24,185	35,935	....	....	434 70	31 05	16 94
612	102 00	62	558	182 90	20 45	623 22	44 61	24,185	35,935	....	392,700	947 40	67 70	22 99
14·65	2 44	1·48	13	4 38	0 48	14 92	......	579	858	....	9,406	22 69	......	7 66
19·78	2 91	408	25·8	4 36	0 31	15 66	......	580	859	....	8,041	21 84	.....	6 20

Z.'

295	49 16	18	195	63 00	...	155 96	25 99	......	......	......	168,340	168 34	28 05	2 06
59	9 83	13½	21	9 67	......	61 91	10 65	.....	......	34,520	....	120 82	20 79	10 14
18	3 00	....	39	11 70	6 69	59 13	14 07	7,888	11,699	....	....	141 70	35 42	20 64
372	61 99	31½	255	84 37	6 69	277 00	50 71	7,888	11,699	34,520	168,340	430 86	84 26	32 84
23	3 24	2·6	15·9	5 27	0 41	17 30	.....	492	730	2,156	10,514	26 91	......	10 94
22	3 13	....	6·37	3 67	0 17	16 47	....	523	871	2,253	9,667	26 44	......	10 30

ROTATION 'Z.'

This rotation of three years' duration includes corn, grain and clover hay, in the order named.

Corn comes after the clover hay. The manure is applied during the fall or during the winter and spring, and the clover allowed to grow up through it, so facilitating the turning under the whole mass of manure and spring growth and late fall growth of clover a few days before the corn is to be sown. The furrow turned is quite shallow, about 5 inches deep, and the land is then thoroughly disc-harrowed, and the corn sown in rows 42 inches apart. It receives later the usual cultivation and care.

Grain follows corn, the land having been ploughed in the fall. With the grain there is sown 10 lbs. red clover, 1 lb. alsike and 5 lbs. timothy seed. The hay is cut twice and last aftermath allowed to grow up to be turned under the next spring for corn. Such a rotation would be particularly valuable to a farmer having sufficient rough land for pasture or for one desirous of keeping as many cattle as possible on the land at his disposal, supposing him willing to grow roots and corn.

ROTATION

Lot.	Location.	Description of Soil. Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	Crops. 1906.	Crops. 1907.	Rent and manure.	Seed, twine and use of machinery.
		p. c.	p. c.	p. c.	y. c.	p. c.	p. c.	p. c.	Ac.	1906.	1907.	$ cts.	$ cts.
H. 1......	H. S. 1.....	30	40	20	10	....	....	....	3·35	Oat hay ...	Pasture.....	20 10	3 35
H. 2.. ..	H. S. 2.....	25	45	20	10	....	....	....	3·15	Pasture.....	Roots	18 90	4 09
H. 3......	H. S. 3.....	10	20	50	20	....	....	....	2·85	Roots	Oat hay	17 10	3 72
	Aggregate....								9·35	....	....	56 10	11 16
	Average per acre in 1907.								1	....	....	6 00	1 19
	Average for four years.								.....	....	....	6 00	1 00

ROTATION

Lot.	Location.	Sand.	Sandy loam.	Clayey loam.	Clay.	Black muck.	Gravel.	Hardpan.	Area in acres.	1906.	1907.	Rent and manure.	Seed, twine and use of machinery.
T. 1......	S. S. 1......	10	90	....	....	....	....	....	1·51	Pasture.....	Pasture.....	9 06	1 51
T. 2......	S. S. 2....	15	85	....	....	....	....	....	2·44	Hay	Hay & past'e	14 64	3 19
T. 3.	S. S. 3......	...	100	....	....	....	....	....	3·27	Pasture....	Green crop & mangels	19 62	4 25
T. 4. ...	S. S. 4.....	15	85	....	....	....	....	....	3·50	Roots	Oat & pea h'y	21 00	4 55
	Aggregate....								10·72	....	....	64 32	13 50
	Average per acre in 1907.								1	....	....	6 00	1 25
	Average for four years.								.....	....	....	6 00	1 20

ROTATION 'H.'

Hog Farm.

This rotation is of three years duration, and includes roots, soiling crops and pasture in the order named. The land is ploughed late in the fall after it has been manured. It is disked the next spring and the roots sown on ridges. The roots receive the usual cultivation, and are of a varied character, including mangels, sugar mangels, sugar beets and turnips devoted to pork production for the most part, the surplus being sold to cattle and the returns invested in meal for pig feeding.

The soiling crop field is sown with various crops suitable for feeding to pigs. What is over and above the amount possible of consumption by pigs is sold to cattle at $2 per ton, and returns used to purchase meal for pork production.

The pasture area is divided into several parts, the seed being sown as far as possible at the same time as the soiling crops the previous year, and not allowed to be eaten too close the first fall, although any good growth is not wasted.

'H2.'—This field was this year under roots, mangels, sugar beets and sugar mangels.

'H3.'—This plot was in grain, soiling crop.

'H1.'—This plot was used for pasture.

'H.'

Items of expense in raising crop of 1907.								Particulars of crop of 1907.						
Manual labour.		Horse labour.												
Hours.	Cost of manual labour.	Hours with single horse.	Hours with team.	Value of horse labour.	Threshing.	Total cost.	Cost for 1 acre.	Grain.	Straw.	Hay.	Roots and ensilage.	Total value.	Value of crop per acre.	Profit per acre in 1907.
Hrs.	$ cts.	Hrs	Hrs	$ cts.	$ cts.	$ cts.	$ cts.	Lbs.	Lbs.	Lbs.	Lbs.	$ cts.	$ cts.	$ cts.
.....	.. ..	....	....	...	.....	23 45	7 09	. .	......	....	Pasture.	56 95	17 00	10 00
389	58 35	24	63	24 90	. . .	106 24	33 73	. ...	.....	....	107,310	134 14	43 05	9 32
15	2 50	2½	47	14 72	.....	38 04	13 34	......	......	17,610	....	61 63	21 62	8 28
404	60 85	26½	110	39 62	.....	167 73	54 07	......	......	17.610	107,310	252 72	81 67	27 60
43·20	6 28	2·83	11·76	4 23	......	......	.....	.....	.. .	1,883	11,477	25 05	..	9 20
49·4	7 61	6·28	7·9	3 97	0 08	17 93	......	113	222	1,130	16,098	28 78	......	6 77
'T.'														
......	.....	...	....	......	......	10 57	7 00	. ....	Hay	Pasture.	....	25 67	17 00	10 00
24	4 00	4	8½	3 55	. ..	25 38	10 40	.....	......	12,025	....	42 09	17 25	6 85
360	54 00	60	111	48 30	. ..	126 17	38 58	.....	7 00	....	69,790	144 79	44 27	5 69
20	3 33	1	26	8 05	.....	36 93	10 55	......	......	19,425	....	67 99	19 42	8 87
404	61 33	65	145½	59 90	......	199 05	66 53	....	.....	31,450	69,790	280 54	97 94	21 41
37·68	5 72	6	13·57	5 58	. ...	18 59	..	.... .	...	2,933	6,510	26 16	. .	5 35
36·5	5 23	6·9	7·8	4 02	....	16 49	......	.....	5 65	1,438	10,198	20 95	. ...	3 48

ROTATION 'T.'

Sheep Farm.

This rotation of four years' duration includes roots grain, hay and pasture.

The area devoted to sheep farming is rather limited, about 10·72 acres. This area is not included in the '200-acre farm.' The whole field had been for several years devoted to pasturing sheep, but it has been divided into four rather unequal fields susceptible of further subdivision and devoted to a rotation considered suitable for sheep.

The root field is devoted to white turnips, Swedes, cabbage, kohl rabi, thousand headed kale, rape, &c. It comes after the pasture, the land being manured and ploughed in the fall.

Grain follows the root crop, and with the grain various clover and grass seeds are sown to prepare for the ensuing two years. The grain may be harvested or used as soiling crop for sheep. The hay field is expected to give one crop of hay and then be devoted to pasture for lambs as soon as they are weaned.

The pasture field is the field that has been in hay the previous year. Alfalfa, red clover, alsike clover, Bromus inermis, and timothy are the clovers and grasses used.

The crops on this rotation were quite satisfactory this year.

In comparison with the eight different rotations discussed above, four other rotations were under way for three years. These rotations spoken of in previous reports as rotations M.N.O.P. were in two cases of three years' duration and in two cases of six years' duration. No hoed crop entered into any of them. Partly on this account and partly on account of the character of the soil of part of the fields, it has been found necessary to abandon these rotations and to put the whole area under hoed crops this year.

Last year the whole area 12 acres was under hay, with results as follows:—

Cost to operate 12 acres.	$ 65 92
Value of product, 53,655 lbs. hay at $7.	187 79
Profit.	$121 87

It will be observed that several items usually considered, rent, manure, etc., do not appear.

REPORT OF THE HORTICULTURIST.

(W. T. Macoun.)

March 31, 1908.

Dr. Wm. Saunders, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the twenty-first Annual Report of the Horticultural Division. There are contained in this report the results of some of the more important experiments conducted during the year 1907; the results obtained and conclusions reached regarding experiments in progress for a number of years, and information regarding other work of this division.

I have the honour to be, sir
Your obedient servant,

W. T. MACOUN,
Horticulturist.

CHARACTER OF SEASON 1907-8.

On April 13, 1907, the snow was almost gone except in drifts, and on the 16th the frost was sufficiently out of the ground to use the spade. April was a very cool month, the coldest in many years. The highest temperature recorded was 67·8° Fahr. on the 29th, and the lowest 11° Fahr. on the 6th. May was also a cool month. On the 4th there was a heavy snowstorm, there being a fall of several inches. This disappeared on the 6th. The last day on which a spring frost was recorded was on May 29, when the thermometer registered 30·3° Fahr. There had also been frost on the 21st and 25th. The highest temperature during May was 86·8° Fahr. on the 15th and the lowest 19·3° on the 5th. In June the weather was moderately warm to warm, but cool at nights. The highest temperature during the month, and of the summer, was 95·8° Fahr. on the 18th. Apple trees, which are usually in full bloom about May 24, were in full bloom this year on June 11, the season being very late. July was much like June in that the days were moderately warm to warm and the nights cool. The highest temperature was 87° Fahr. on the 17th. At the end of the month the season was still noticeably late for many things. August, like June and July, was only moderately warm for a summer month. The nights still continued cool, the temperature falling below 50° Fahr. on eighteen days. On the 19th the temperature dropped to 39° Fahr. The highest temperature in August was 93·3° Fahr. on the 11th. During the summer there was sufficient rain to keep most things growing well in well cultivated soils, but in the month of August the rainfall was light and more would have done good, and plants under some conditions suffered for want of it. The soil became drier until September 3, when there were heavy rains, and by winter the ground was about saturated. September was moderately warm to rather cool. There was only one day on which frost was recorded, namely, the 26th, when the temperature fell to 30° Fahr., injuring tender plants. The highest temperature was 84·4° Fahr. on the 15th. October was a cool month. The highest temperature was 66° Fahr. on the 4th and 17th. The first severe frost injuring the grapes was on the 9th, when the temperature fell to 23·8° Fahr. November was a cold month for the season. The lowest

temperature was 8·2° Fahr. on the 29th. The ground became frozen on the 12th, and by the 18th there were from four to six inches of frost. The ground thawed out by the 21st, but froze up again, and winter may be said to have set in on the 25th, when there was a fall of snow on frozen ground.

There were few low temperatures in December, the lowest being 7° Fahr. below zero on the 5th, the only day when it was below zero during the month. It was eighteen times below zero in January, 1908, although there were few times when it was very cold. The lowest temperature of the month was 28·8° below zero, on the 30th. Only one other day in the month did it fall below 20° Fahr. below zero. In February it was sixteen times below zero. The lowest temperature of the winter was on the 5th, when the thermometer registered 30·8° Fahr. below zero. Only one other day in February did it fall below 20° below zero. It was five times below zero in March. The lowest temperature during the month was 10° Fahr. below zero on the 10th. On March 25 it was 1° below zero. The winter of 1907-8 was one of almost steady, though on the whole moderate, cold. There were few thaws. The snowfall was heavy, the heaviest in many years. It afforded excellent protection for herbaceous plants and bush fruits, which came through the winter well. The snow began to go about the middle of March, but was slow in disappearing, and by the end of the month there must have been fully two feet on the level. Owing to the great depth of snow there was practically no frost in the ground during the winter.

FRUIT AND VEGETABLE CROPS.

While the apple crop was a medium one in 1907 in the provinces of Ontario and Quebec the quality of the fruit was not as good as it might have been owing to dry weather in summer, which caused the fruit to be much undersized except in the best cultivated orchards. Although the fruit was small there was not much apple spot, but a large quantity of the fruit was injured by the codling moth. The prices obtained for the fruit were good in the early part of the season, but quite low later.

Pears, peaches, plums and cherries were all light crops, and the prices obtained for these fruits were good, especially for peaches, which gave very handsome returns to the growers.

The crop of grapes was a good one, but the fruit did not ripen well owing to the cool autumn. The crops of raspberries and strawberries were below the average. Currants and gooseberries gave good crops on the whole.

At the Central Experimental Farm the crop of apples was a good one, the best that has yet been produced here. There were few European plums and a medium crop of American plums, which were somewhat smaller than usual owing to dry weather.

There was a light to medium crop of cherries, some varieties producing a fairly good crop. The crop of grapes was good, but owing to the cool weather in September they did not ripen as well as in some years. The crop of currants was good; of raspberries, medium; of gooseberries, light owing to spring frosts; blackberries, light; strawberries were a medium crop.

Most vegetables did well in the provinces of Ontario and Quebec in 1907, but potatoes were a little under the average. At the Experimental Farm they were also good on the whole, with the exception of potatoes, which suffered in the dry weather and did not give as large a crop as they would otherwise have done.

MEETINGS ATTENDED AND ADDRESSES GIVEN.

A number of important meetings were attended during the past year and addresses given at most of them. At the Biennial Meeting of the American Pomological Society, held at Jamestown Exposition, Virginia, on September 24-26, 1907, an address was delivered on 'Fruits of Canadian origin,' and at the Congress of Horticulture held on September 23, at the same place, a paper on 'Horticultural conditions in Canada.' A paper on 'Variations in Swayzie apple seedlings' was presented at the annual meeting of the Society for Horticultural Science, also held

at Jamestown on September 24 to 26. A meeting known as the International Conference on Plant Hardiness and Acclimatization, under the auspices of the Horticultural Society of New York, was held at New York and Bronx Park on October 1, 2 and 3, 1907, at which an address was given on 'Some conclusions reached in regard to the hardiness of trees.' At the annual meeting of the Ontario Fruit Growers' Association, at Toronto, on November 12 and 13, 1907, a 'Report on new fruits' was read, and an address given on 'Top grafting and the influence of stock on scion.' At the annual meeting of the Vegetable Growers' Association, on November 14 and 15, a report was read on 'Some experimental shipments of tomatoes to Glasgow in 1907.'

At the invitation of the Vermont State Horticultural Society, the annual meeting of that society was attended on December 3 and 4, 1907, and an address given on 'What is known regarding the influences affecting fruit production.' A paper on 'Ten forms of winter injury' was read at the annual meeting of the Quebec Pomological Society, held at MacDonald College, Ste. Anne de Bellevue, Que., on December 18 and 19. The short courses in horticulture at the Agricultural College, Truro, N.S., January 2, 3 and 4, 1908, and the Agricultural College, Guelph, Ont., on January 27-29, were attended, and addresses given at each. At the Hamilton Horticultural Society an address was given on January 30. Addresses on 'Individuality in fruits' and 'Cover crops' were given at the meeting of the Niagara Peninsula Fruit Growers' Association, held at Grimsby and St. Catharines on March 5, 6 and 7, 1908.

In April, 1907, a trip was made to the Agricultural Experiment Stations at Geneva and Ithaca, N.Y., and at Amherst, Mass., to examine the horticultural equipment there in anticipation of the new horticultural building erected at the Central Experimental Farm later in the season. A number of useful suggestions were obtained. On the same trip a visit was made to the Arnold Arboretum, Jamaica Plain, Mass., and as a result a fine collection of trees and shrubs, most of them rare or new species, was received the following autumn as a donation from that institution.

The Toronto Exhibition was attended in September, and the Flower, Fruit and Honey Show in November, at which many interesting horticultural products were seen and information obtained. While attending the Toronto Exhibition parts of the Niagara peninsula were visited with a view to learning more about the fruit industry there. The annual exhibition of the Vankleek Hill Horticultural Society was attended on August 30, 1907, and after judging the horticultural products an address was given.

ACKNOWLEDGMENTS.

We take this opportunity of acknowledging the services of some of those who have helped to make the work of the past year successful. In the correspondence and general work in the office, Mr. J. F. Watson has again rendered able assistance, while in the field Mr. H. Holz, foreman, continues to superintend the work outside satisfactorily. The Arboretum and Botanic garden has been well cared for by Mr. F. Horn, while Mr. Horace Reid continues to keep accurate records of the experiments and takes many field notes.

DONATIONS.

A large number of interesting things were donated to the Horticultural Division during last year, as in previous seasons, and an appreciative acknowledgment is herewith made of them. It is gratifying to know that so many persons are sufficiently interested in the work, and generous enough to contribute new and interesting plants and seeds to be tested at the Central Experimental Farm. Following will be found a list of the names of those who sent material, with their donations:—

Sender.	Donations.
Wm. F. W. Fisher, Burlington, Ont	Scions, Duke of Luxemburg apple.
A. H. Stead, Tapley's Mills, N.B	Scions, seedling pear.
J. Raymond Ball, Knowlton, Que	Tomato seed, Early King.
New Jersey Agrl. Expt. Station, New Brunswick, N.J., U.S.	Seeds of cross-bred vegetables.
W. H. Dempsey, Trenton, Ont	Scions, Coos River Beauty apple.
Joseph Persons, Sweetsburgh, Que	Scions, seedling apples.
Robert Hamilton, Grenville, Que	Scions, sweet apple.
Messrs. O. F. Brand & Son, Faribault, Minn., U.S.	Scions, Estaline and Judge Barry apples.
C. L. Stephens, Orillia, Ont	Scions, seedling crab apple.
Miss Willmott, Warley Place, Great Warley, England	Collection of seeds.
Botanic Gardens, Lyons, France	Collection of seeds.
Botanic Gardens, Tabor, Bohemia	Collection of seeds.
H. E. Isenor, Milford Station, N.S.	Scions, large red apple.
J. S. Pearce, London, Ont	Scions, unknown apple.
Asa A. Johnston, Cowansville, Que	Scions, Kinkead apple.
J. Hawkins, Ojibwa, Ont	Scions, apple.
Wm. Moore, Mansfield, Ont	Scions, seedling apple.
W. Niemetz, Pskov, Russia	Seeds, vegetable.
Botanic Gardens, Lausanne, Switzerland	Collection of seeds.
Botanic Gardens, Odessa, Russia	Collection of seeds.
Botanic Gardens, Copenhagen, Denmark	Collection of seeds.
Rev. J. R. Lawrence, Raynham, Mass., U.S.	Potatoes, collection.
Jas. A. Findley, Pinnacle, Que	Tubers, Pinnacle potato.
Agricultural Experiment Station, Ames, Ia., U.S.	Scions, Hutchins Red apple, and Tree of Fluke pear and Patten's Brilliant apple. Pits of Lone Tree peach.
C. Young, Richards Landing, Ont	Scions, apple seedlings No. 1, No. 2.
J. P. F. Martin, Deloraine, Man	Seed, Garden Huckleberry.
Dr. E. Grignon, Ste. Agathe des Monts, Que.	Early ripening corn.
Frank O. Harrington, Williamsberg, Ia	Scions, Lone Tree peach.
G. M. Cunningham, Collingwood, Ont	Tubers, White Giant potato.
Charles W. Smith, Sand Beach, N.S	Plants, seedling strawberry.
V. Tellier, St. Jean Baptiste, Montreal	Ten grafted plants St. Vincent grape.
L. Wagner, Branch La Have, N.S	Tubers, White Beauty potato.
T. Rowan, Macgregor, Man	Scions, Willard plum, and Pearmain potatoes.
Wm. Wilson, Port Arthur, Ont	Tubers, King Edward potato.
L. L. Livingston, Frankville, Ont	Plants, seedling strawberry.
J. S. Honey, Warkworth, Ont	Shipper's Pride and Dibble's Favorite potatoes.
Peter Reid, Chateauguay Basin, Que	Scions, Reid apple.
R. A. Marrison, Cataraqui, Ont	Scions, Phenomenal crab apple.
Ontario Agricultural College, Guelph, Ont	Plants, Bubach strawberry, and cuttings, Red Cross currant.
I. Pike, Bethesda, Ont	Scions, Pike seedling apple.
W. J. Kerr, Ottawa, Ont.	Potatoes, Early Exciter, Planet, Wellington, Vulcan, Extra Early Gault, Noxall, Big Rose, Bruce, Early Bangor; also, Scions, Hutchin's Red apple.
Agricultural Experiment Station, Burlington, Vt., U.S	Seeds of Wild species of potatoes.
J. A. McIntyre, Thedford, Ont	Potatoes.
P. Lemelier, Warick, Que	Potatoes.
Hiram J. Presley, Port Huron, Mich	Collection of potatoes.
Newton Anderson, Damascus, Ont	Potatoes.
Royal Botanic Gardens, Glasnevin, Ireland	Collection of seeds.
Missouri Botanical Garden, St. Louis, Mo., U.S.	Collection of seeds.
Botanical Garden, Tiflis, Caucasus	Collection of seeds.
Botanical Garden, Jurjew	Collection of seeds.
G. Robertson, St. Catharines, Ont	Seeds of selected Earliana Tomato.
D. Gitlatley, Gitlatley, B.C	Seeds of Crack-Proof Tomato.
D. Smith, Ottawa, Ont	Selected Muskmelon seed.
Arnold Arboretum, Jamaica Plain, Mass., U.S.	Collection of trees and shrubs.

NEW HORTICULTURAL BUILDING.

The need of better building accommodation for the Horticultural Division has long been felt, but it was not until 1907 that money was available for the erection of a suitable structure. This building, which is 50 x 50 feet, has been erected. It is of wood and three stories high. In order to have the cellar well insulated, especial

attention was paid to the foundation walls, which are made of concrete with an air space. There are two air spaces in the part above ground, this part being faced with concrete blocks. Adequate provision was made for ventilating the cellar, which is divided into two main parts, one for fruits and the other for vegetables and trees. In one part of the cellar is an ice cold storage room. The fruit cellar will be used not only for storing the fruit but for testing the keeping quality of the many seedling varieties of apples now fruiting at the farm, and for other experiments. The ground floor is used for work rooms and an office for the foreman. There is also an exhibition room which will be open to the public, and it is planned to have fresh fruit in this room most of the year. The walls of this part of the building were specially constructed so that the room may be as cool as possible in the summer. The upper story is divided into four main rooms which are used for storing baskets, boxes, &c., and for drying seeds.

SEEDLING FRUITS OF CANADIAN ORIGIN.

Every year there are a number of seedling fruits sent in for examination and description and during the past year there were some very good ones received. Some of these were sent in response to the following circular:—

EXPERIMENTAL FARM, OTTAWA,
November 20, 1907.

DEAR SIR,—During the past three hundred years many varieties of fruits have originated in Canada, some of which are of great merit. The Dominion and Provincial Governments through their official publications have recorded a large number of those originated, but up to the present time no complete list of Canadian fruits has been published.

In view of the fact that many new varieties are being originated every year, it seems desirable, before the task becomes too great, to prepare as complete a list as possible so that in future all that it will be necessary to do will be to add to it the new ones.

The Horticulturist of the Experimental Farm would, therefore, be grateful if you would, either personally or through the Horticultural Society or Farmers' Institute you may represent, assist in preparing this list by sending to him the names of any seedling or cross-bred fruits of Canadian origin which you think should be recorded. It is especially desired to get information regarding local or unnamed seedlings of merit. Please send, if possible, the originator's name, the date of origin, the name of the place where originated, a description of the fruit, and other information regarding it. Any or all of these particulars would be appreciated. Even if the name and address only of the originator were sent it would enable us to correspond with him and get further information.

The Horticulturist will be glad to examine and report on merits of any new fruits which may be sent to him. Letters or mail parcels under five pounds in weight may be sent free of postage.

Yours truly,

W. T. MACOUN,
Horticulturist.

As stated, there were a number of responses to the above circular and several very promising seedlings were received. It is hoped that a still larger number will be received in the near future so that a fairly complete record may be made of existing Canadian seedlings of merit.

SEEDLING FRUITS RECEIVED FOR EXAMINATION IN 1907.

Record Number.	Province.	Name and Address of Grower or Sender.	Description of Fruit.
393	Prince Edward Island.	Adonijah Marks, Clifton.	'Golden Crown.' See full description.
394	New Brunswick.	P. White, Narrows......	Medium in size, oblate, flattened at ends, angular; yellow with a faint pink blush on sunny side towards basin; subacid; pleasant flavour and above medium in quality; season, late winter. Not attractive nor juicy enough.
395	" ..	C. N. Vroom, St. Stephen	Early crab apple. See full description.
396	" ..	" ..	About the size of Transcendent crab apple; roundish; pale yellow; briskly subacid; little flavour; quality medium; season October. Not desirable; lacks quality.
397	" ..	" ..	Late crab apple. About the size of Transcendent; oblong conical; pale greenish-yellow well washed with deep, rather dull, crimson; subacid; little flavour and but medium in quality; season October or later. Not attractive enough nor good enough in quality.
398	" ..	T. M. Stone, Penobsquis.	In bad condition when received. Said to be a good keeper.
399	Ontario. ...	Wm. Moore, Mansewood.	See full description.
400	"	Travers, Lewis, Ottawa.	Above medium size, roundish, angular; greenish-yellow, splashed and washed with orange-red; subacid; little flavour and medium in quality; season evidently October. Not sufficiently promising.
401	"	W. M. Robson, Lindsay.	Seedless apple. See full description.
402	"	W. L. Herriman, Lindsay	Large, oblate conic; pale yellow splashed with purplish red, mostly on sunny side; subacid with a pleasant but not high flavour; quality above medium; season evidently November and perhaps later. Not sufficiently promising to compare favourably with named varieties of the same season.
403	"	John McConnell, sr.. Elphin.	Large, roundish conical; pale green, well washed with deep red; briskly subacid; pleasant but not much flavour; quality above medium; season probably November and December. Not sufficiently promising.
404	"	" " ..	Medium in size, roundish, angular; yellow, washed and splashed with orange-red; sub-acid with a peculiar and not altogether pleasant flavour; quality medium; season evidently mid to late winter. Not sufficiently promising.
405	"	D. G. Mode, Vankleek Hill.	See full description.
406	"	Wm. Chambers, Carnarvon.	See full description.
407	"	A. E. Bellman, Bowmanville.	See full description.
408	"	Rev. E. B. Stevenson, Guelph.	See full description.
409	"	R. Schwerdtfeger, Morrisburg.	'Flat Dutch.' See full description.
410	"	" " ..	'Saxon Red.' See full description.
411	"	" " ..	'Jacob Red.' See full description.
412	"	" " ..	'Henry White.' See full description.
413	"	" " ..	'John A.' Medium to below medium in size, oblate to roundish; pale greenish-yellow, washed more or less with reddish-pink; subacid with little flavour; quality medium; season evidently mid to late winter. Not promising.
414	"	" " ..	'Grandma Sweet.' Below medium in size, conical, angular; pale yellow with a faint pink blush on sunny side; sweet; quality above medium; season evidently autumn to early winter. Not sufficiently promising.
415	"	Isaac Pike, Bethesda ...	See full description.
416	Quebec....	Jos. Cloutier, Rivière aux Chiens.	Seedling No. 1. Medium in size, conical, angular; pale green, thinly washed with pinkish-red about base; briskly subacid, little flavour; quality medium; season evidently late winter. Not desirable where better varieties will succeed.
417	"	" " .	Seedling No. 2. See full description.
418	"	" " ..	Seedling No. 3. See full description.

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SEEDLING FRUITS—*Concluded.*

Record Number.	Province.	Name and Address of Grower or Sender.	Description of Fruit.
419	Quebec.....	Jos. Cloutier, Rivière aux Chiens.	Seedling No. 4. Medium in size, oblate; pale greenish-yellow, washed and splashed with crimson; briskly subacid, little flavour; quality medium; season winter. Not good enough in quality.
420	"	" " ..	Seedling No. 5. See full description.
421	"	Jules Lagace, Rivière du Loup en bas.	Below medium in size, roundish; pale green washed and splashed with deep crimson; quality above medium; season December, perhaps later. Resembles Wealthy.
422	"	G. D. Hodgson, Hudson.	See full description.
423	British Columbia.	J. T. Collins, Salt Spring Islands.	See full description.
424	Newfoundland.	J. E. Lake, Fortune	Seedless (?). See full description.
425	Ontario.....	John P. Williams, Bloomfield.	Pear. See full description.

393. Golden Crown.—Above medium in size; roundish, almost oblong, somewhat flattened on ends, slightly angular; cavity medium depth and width; stem short, stout; basin deep, open, slightly wrinkled; calyx open; colour yellow with traces of pinkish-red on sunny side; dots obscure; skin moderately thick, tender; flesh white, tender, breaking, juicy; core medium; subacid, pleasant flavour; good quality; season evidently December and later.

Said to be a seedling of a large imported apple. Seed planted about 1880. Apple grown by Adonijah Marks, Clifton, P.E.I. Said to bear better than Yellow Transparent. The original tree is growing on a hill exposed to the northwest, and is said to be 'as hardy as the oak.'

Resembles Grime's Golden very much.

395. Crab Apple Seedling from C. N. Vroom, St. Stephen, N.B.—Size medium to above, $1\frac{5}{8}$ by $1\frac{1}{2}$ inches; form roundish, slightly angular; cavity medium depth and width; stem medium length, moderately stout; basin shallow, open, wrinkled; calyx closed; colour yellow, well washed with deep orange red; dots obscure; skin thin, tender; flesh yellow, firm, breaking, moderately juicy; core large; subacid, not astringent; above medium in quality; season evidently late August.

Said to be the earliest apple in the vicinity of St. Stephen. About the size of Transcendent crab apple.

399. Seedling from Wm. Moore, Mansewood, Ont.—Size medium to above; form oblate, conic, flattened; cavity deep, open; stem short, stout; basin deep, medium width, slightly wrinkled; calyx open; colour greenish-yellow, splashed and washed with dull red on sunny side; dots moderately numerous, grey, conspicuous; skin moderately thick, fairly tender; flesh yellow, moderately juicy; core medium; sweet, rich, good flavour; very good quality; season evidently mid to late winter.

Of very good quality for a sweet apple. Should be very desirable for home use.

401. Seedless Apple from W. M. Robson, Lindsay, Ont.—Fruit large; oblong, flattened at ends; cavity deep, medium width; stem short, moderately stout; basin deep, open, wrinkled; calyx open to core; pale yellowish green washed and splashed with rather dull red; dots few, pale, indistinct; skin moderately thick, tender; flesh white, tender, almost melting, moderately juicy; core large, really two cores one above the other; above medium quality; season evidently October and November.

There were no seeds in two specimens of this apple examined. It is not attractive enough in appearance nor good enough in quality to be desirable for commercial purposes.

405. Seedling Apple from D. G. Mode, Vankleek Hill, Ont.—Above medium in size; form roundish, conical; cavity deep, medium width; stem short, moderately stout; basin medium depth and width, wrinkled; calyx open; pale yellowish-green washed with pinkish-red on sunny side; dots obscure; skin moderately thick, moderately tough; flesh white, firm, moderately juicy; core medium; subacid, little flavour, but what there is suggests Canada Baldwin; quality medium; season mid to late winter.

An apple of good size and a good keeper.

406. Seedling from Wm. Chambers, Carnarvon, Ont.—Large; form oblate; cavity deep, open; stem short, stout; basin deep, open, slightly wrinkled; calyx partly open; yellow well splashed and streaked with bright, purplish red; dots obscure; skin moderately thick, tender; flesh dull white, crisp, tender; core medium; flavour subacid, sprightly, pleasant; quality good; season apparently through January or later. Thought to be equal to Duchess in hardiness and said to seldom have an off year in bearing. Mr. Chambers got scions from Thomas C. Robson, Allsaw, Ont. (now of Alberta). Has been growing 14 years and fruiting eight years. Five barrels in 1907. A very promising seedling if as hardy as is said. Resembles a Duchess in outward appearance, but is larger. Flesh and flavour somewhat like Gravenstein.

407. Seedling from A. E. Bellman, Bowmanville, Ont.—Medium in size; roundish, slightly oblong; cavity deep, medium width; stem short, slender; basin medium depth; calyx open; yellow almost entirely covered with deep crimson; dots moderately numerous, yellow, distinct; skin moderately thick, moderately tender; flesh white with traces of red, tender juicy; core medium; subacid, pleasant flavour; quality good to very good; season evidently through January. This is a handsome apple of good quality of the Fameuse type. Quite promising. Will be very promising if a better keeper than McIntosh. Said to be in bearing four or five years.

408. Seedling from Rev. E. B. Stevenson, Guelph, Ont.—Fruit above medium to large; roundish, conical; cavity medium depth and width, russeted; stem short, slightly angular, stout; basin medium depth and width, almost smooth; calyx open; pale yellowish-green washed more or less with dull, pinkish-red, mostly on sunny side; dots fairly numerous, grey, distinct; skin moderately thick, fairly tender; flesh yellowish, tender, moderately juicy; core medium; sweet, pleasant flavour; quality good for a sweet apple; season evidently December and January.

This apple is good in quality for a sweet apple but is not attractive in appearance.

409. Flat Dutch.—Medium size; roundish; cavity narrow, shallow to medium; stem short, moderately stout; basin almost smooth, shallow to medium, medium width; calyx partly open; greenish yellow, splashed and washed with crimson; dots obscure; skin moderately thick, tender; flesh white or yellowish, tender, breaking, juicy; core medium; subacid, pleasant, but not high flavour; quality good; season evidently early winter to February. An apple of good texture and rather attractive appearance. Not quite good enough to compare favourably with Fameuse and McIntosh. A seedling of Fameuse grown by R. Schwerdtfeger, Morrisburg, Ont., with the same history as Jacob Red.

410. Saxon Red.—Medium size; oblong, conical; cavity deep, medium width; stem medium length, slender; basin medium depth and width, wrinkled; calyx closed; yellow, well washed with rich crimson and splashed and streaked with darker shades; dots obscure; skin moderately thick, moderately tender; flesh yellowish, tinged with red, tender, moderately juicy; core large; mildly subacid, pleasant flavour; good quality; season early winter, probably December and January.

An attractive looking apple, but not as good as McIntosh either in appearance or quality. A seedling of Fameuse grown by R. Schwerdtfeger, Morrisburg, Ont., with the same history as Jacob Red.

411. Jacob Red.—Medium size; form roundish, flattened a little at ends, slightly angular; cavity medium depth and width, russeted; stem short, stout; basin medium depth and width, smooth; calyx open; pale yellow washed and splashed with crimson; dots moderately numerous, grey, distinct; skin moderately thick, tender; flesh yellowish, firm, juicy; core medium; subacid, pleasant flavour; quality good; season evidently mid to late winter.

A promising winter apple of attractive appearance. A seedling of Fameuse, grown by R. Schwerdtfeger, Morrisburg, Ont., who gives the following history of it: In the year 1820 the late John Marsilous, of Riverside, got some Fameuse apples from a batteaux on the way to Hamilton. Going to a lumbering shanty to eat some dinner he dropped the seeds, and in 1824 Jacob F. Schwerdtfeger, father of R. Schwerdtfeger, got eight young trees which came up, and transplanted them. Two of these trees are now living.

412. Henry White.—Medium size; form oblate to roundish; cavity medium depth, rather open; stem broken, probably slender; basin medium depth and width, smooth; calyx open; pale yellow washed with reddish-pink on sunny side; dots obscure; skin moderately thick, tough; flesh white, tender, juicy; core medium to small; subacid, pleasant, good flavour; quality good to very good; season evidently mid to late winter.

A promising apple somewhat resembling Princess Louise in appearance, flesh and flavour. A seedling of Esopus Spitzenburg. From a specimen from Pennsylvania, grown by R. S. Schwerdtfeger, Morrisburg, Ont., fifty-nine years ago. The old tree is now dead.

415. Seedling from Isaac Pike, Bethesda, Ont.—Large; form oblate, conic; cavity deep, open, russeted; stem medium length, stout; basin narrow, rather deep, smooth; calyx open; yellow, almost entirely washed with crimson; dots moderately numerous, yellow, distinct; skin moderately thick, tender; flesh dull white or yellowish, crisp, juicy, tender; core medium; sprightly subacid with pleasant flavour, somewhat like Northern Spy; quality very good; season mid to late winter. A handsome apple, resembling Akin.

417. Seedling No. 2, from Jos. Cloutier, Rivière aux Chiens, Que.—Medium size; form oblate to roundish; cavity narrow, medium depth, russeted; stem short, slender; basin narrow, medium depth, wrinkled; calyx partly open; pale green washed with red on sunny side; dots obscure; skin moderately thick, rather tough; flesh white, fairly juicy; core medium; subacid, pleasant flavour; quality above medium; season December, evidently through most of winter. Trees grafted about fifty years ago by L. Gagnon from seedlings said to have been one hundred years old. May be useful in colder districts.

418. Seedling No. 3, from Jos. Cloutier, Rivière aux Chiens, Que.—Small; form oblate to roundish, conic; cavity shallow, open, slightly lipped; stem short, stout; basin very shallow, narrow, wrinkled; calyx partly open; pale yellow well splashed and washed with crimson; dots obscure; skin moderately thick, moderately tender; flesh white, tinged with red, moderately juicy; core medium; subacid, slightly astringent; quality medium to above; season evidently all winter.

Trees grafted about fifty years ago from seedling said to be about one hundred years old. A rather attractive little apple. Said to be larger in better seasons.

420. Seedling No. 5, from Jos. Cloutier, Rivière aux Chiens, Que.—Medium size; form conical; cavity open, quite shallow, practically none; stem medium length, moderately stout; basin narrow, shallow, wrinkled; calyx partly open; pale yellow well washed with attractive crimson; dots obscure; skin moderately thick, tough;

flesh white, tinged with red, especially about core line, moderately juicy; core large; briskly subacid, pleasant flavour; quality above medium; season evidently most or all of the winter.

Trees grafted about fifty years ago by L. Gagnon from trees said to be about 100 years old.

This is the most attractive of all of the seedlings sent by Mr. Cloutier, but is not good enough in quality.

422. Seedling from G. D. Hodgson, Hudson, Que.—Medium size; form oblate to roundish; cavity medium depth and width, usually russeted, sometimes not; stem short to medium, slender; basin medium depth and width, smooth; calyx closed; pale green washed with deep crimson; dots obscure; skin moderately thick, tough; flesh dull white, crisp, tender, juicy; core medium; subacid, pleasant flavour; quality good; season evidently mid to late winter.

Has been growing in the vicinity of Hudson for over 50 years. Tree said to be hardy and a good keeping apple. Bears every year.

Still in good condition. While not especially attractive in appearance, though very fair in this respect, this is a promising apple on account of hardiness, quality, and keeping properties.

423. Cross between Newtown Pippin and Rhode Island Greening, from J. T. Collins, Salt Spring Island, B.C.—Large; oblong; cavity narrow, medium depth, russeted towards base; stem short stout; basin deep, open, wrinkled, calyx open; greenish yellow, yellow or orange on sunny side; dots moderately numerous, brown, distinct; skin smooth, thick, moderately tough; flesh dull white or yellowish, moderately juicy, firm, showing dry rot about core; core large; mildly subacid, pleasant flavour; quality good; season evidently mid winter.

Said to be a cross between Newtown Pippin and Rhode Island Greening, but resembles N. W. Greening very much. Believe it to be the same.

424. Seedless Apple, from John E. Lake, Fortune, Burin District, Nfld.—Medium to below in size; form roundish, prominently angular, flattened at ends; cavity practically none because so shallow and open; stem medium length, stout; basin open; calyx open, lobes long; pale yellowish-green, sometimes with a bronze blush on sunny side; dots obscure; skin moderately thick, tender; flesh greenish-white, moderately juicy; core large, open, well developed; briskly subacid, little flavour, somewhat astringent; poor quality. Season perhaps early or late winter.

Not mature. Two apples examined. One had nine well developed but immature seeds. One specimen was seedless. Of no commercial value.

425. Pear.—John P. Williams, Sr., Bloomfield, Ont.—Medium size; obovate, obtuse pyriform; cavity shallow; stem medium length, stout; basin shallow, open, smooth; calyx open; yellow with a reddish blush; dots obscure; skin moderately thick, tender; flesh dull white or yellowish, firm; core medium; sweet, little flavour; quality medium; season late winter. A good keeper.

APPLES ORIGINATED IN THE HORTICULTURAL DIVISION, CENTRAL EXPERIMENTAL, FARM, OTTAWA.

In the Annual Report for 1906 descriptions were published of a number of named seedlings and cross-bred apples originated in the Horticultural Division of the Central Experimental Farm. In 1907 there were seventy-three new varieties fruited, and following are descriptions of the best of these. It is very gratifying to note the comparatively large percentage of good apples which are being obtained from these seedlings. Those which are described are being propagated with a view to testing them further as grafted trees, for while they may do well as ungrafted seedlings they may show some weakness when grafted. From the varieties described there will, no doubt, be quite a number which will not prove good enough to grow for commercial purposes,

but from those which have fruited already and the large number of seedlings and cross-bred apples yet to fruit, there will, it is expected, be some which will take their place among the best of those now on the market. Among the varieties described and named this year are three from a cross made by Mr. John Craig when horticulturist of the Central Experimental Farm, the parents being McMahan (female) and Scott Winter (male). Plate No. 4 shows specimens of the parents and twenty different varieties from this cross.

Bruno (Scott Winter Seedling).—Above medium in size; oblate; cavity medium depth and width; stem short, moderately stout; basin deep, medium width, wrinkled; calyx closed; greenish-yellow well washed with dark, orange-red and purplish-red; dots few, pale, indistinct; skin moderately thick, tender; flesh white, crisp, tender, juicy; core medium; subacid, pleasant but not high flavour; quality above medium; season November to January, probably, or perhaps later.

Promising. Resembles Scott Winter somewhat in outward appearance. Looks as if it had Edgehill blood, as appearance and flesh are somewhat like it

Clive (Wealthy Seedling).—Large; roundish, regular; cavity deep, medium width; stem short, stout; basin deep, open, almost smooth; calyx partly open; pale, greenish-yellow well washed with rich crimson; dots moderately numerous, small, whitish, indistinct; skin moderately thick, moderately tender; flesh dull white rather coarse, firm, crisp, moderately juicy; core medium; subacid, good, pleasant flavour; quality good; season evidently October to November.

A very handsome apple of good quality and one of the most promising. Better than Wealthy in quality and about the same season, perhaps later. Resembles Wealthy considerably in outside appearance and character of flesh.

Eric (Russian Seedling).—Above medium in size; conical, slightly angular; cavity medium depth and width; stem medium length, stout; basin medium depth and width, slightly wrinkled; calyx open; yellow, well splashed and streaked with crimson; dots obscure; skin moderately thick, tender; flesh white, tender, tinged with red, moderately juicy; core small to medium; briskly subacid, pleasant flavour; quality good; season October.

This variety is attractive in appearance and good in quality.

Garner (Langford Beauty Seedling).—Above medium in size; oblate; cavity deep, medium width, russeted; stem medium to long, slender; basin medium to open, deep, wrinkled; calyx closed; pale greenish-yellow washed and splashed with dark crimson; dots few, yellow, distinct; skin moderately thick, tender; flesh white, firm, juicy; core medium; subacid, pleasant flavour; quality good; season probably late September to October.

A promising apple. Does not resemble Langford Beauty at all.

Granby (McMahan female X Scott Winter male).—Above medium size; oblate to roundish, conic, somewhat angular; cavity narrow, deep, russeted; stem short, moderately stout; basin deep, medium width, wrinkled; calyx small, closed; yellow, well washed and splashed with attractive orange-red; dots obscure; skin moderately thick, moderately tough; flesh dull white, tender, with traces of red, moderately juicy; core medium; briskly subacid, not much flavour; quality above medium; season December to late winter.

This is much like a large Scotch Winter, but not so tender in flesh. A rather promising apple and handsome in appearance.

Junco (Wealthy Seedling).—Medium size; oblate, angular; cavity narrow, medium depth, russeted; stem short, moderately stout; basin deep, open, wrinkled; calyx open; pale yellow, washed with crimson; dots moderately numerous, yellow, indistinct; skin thick, moderately tough; flesh yellowish, firm, juicy; core small; subacid, pleasant flavour; quality good; season December, probably through the winter.

An attractive looking apple and a good keeper.

Kelso (McMahan female X Scott Winter male).—Medium in size; oblate; cavity deep, medium width, russeted; stem medium length to short, moderately stout; basin open, deep, slightly wrinkled; calyx open; pale yellow, well washed with bright crimson; dots obscure; skin moderately thick, tough; flesh dull white, tender, moderately juicy; core small, closed; acid, pleasant flavour; quality above medium; season early to mid winter and perhaps later. Much like Scott Winter in character of flesh. A handsome apple.

Linton (Winter St. Lawrence Seedling).—Medium size; roundish, regular; cavity medium depth and width; stem medium length, slender; basin medium depth and width, wrinkled; calyx closed; pale yellow thinly splashed with bright red; dots obscure; skin moderately thick, tender; flesh white, tender, juicy; core medium; mildly subacid, pleasant flavour; quality good; season early to mid September.

Resembles Winter St. Lawrence somewhat in outward appearance, but flesh is whiter and tenderer.

Medford (Wealthy Seedling).—Medium size; oblate; cavity open, medium depth; stem short, moderately stout; basin open, deep, wrinkled; calyx closed; pale yellow, well splashed and washed with crimson; dots few, white, indistinct; skin moderately thick, moderately tough; flesh white tinged with red, crisp, tender, rather breaking, juicy; core small; flavour subacid, sprightly, pleasant, much like that of Wealthy; quality good; season early September.

A promising apple much like a Wealthy in general appearance, though flatter. and probably a month earlier.

Oscar (Russian Seedling).—Above medium size; conical, almost oblong; cavity narrow, medium depth, russeted near base; stem medium length, moderately stout; basin shallow to medium, medium width, wrinkled; calyx closed; pale yellow well washed and splashed with bright crimson, attractive; dots moderately numerous, grey, indistinct; bloom thin, pinkish; skin moderately thick, moderately tough; flesh white with traces of red, tender, juicy; core above medium size; briskly subacid, little flavour; quality above medium; season early October.

This is a very handsome apple and should sell well. It was one of the earliest bearers in the Russian seedling plantation. This should be a useful apple even in the Ottawa district as it comes in before Wealthy. It is firm and should ship well.

Severn (Swayzie Seedling).—Medium size; roundish, angular, flattened at ends; cavity deep, open, russeted; stem short, slender; basin deep, open, smooth; calyx closed or partly open; yellow, well washed with orange red and splashed with crimson; dots moderately numerous, yellow, prominent; skin moderately thick, tender; flesh tender, breaking, moderately juicy; core small; subacid, pleasant flavour, somewhat Swayzie-like; quality good; season October. A good dessert apple and may be useful. Resembles Swayzie in breaking flesh.

Sorel (McMahan X Scott Winter).—Above medium size; oblate, conic; cavity deep, medium width, russeted; stem short to medium, stout; basin deep, open, wrinkled; calyx closed or partly open; pale yellow, washed on sunny side with bright, attractive red; dots obscure; skin moderately thick, tender; flesh white with a yellowish tinge, crisp, moderately juicy; core medium; subacid, pleasant flavour; quality above medium; season December through the winter.

A handsome apple, worthy of further test. May prove useful. Shape somewhat like Scott Winter, but colour much like McMahan. Flavour also somewhat like McMahan.

Sonora (Langford Beauty Seedling).—Medium size; roundish; cavity medium depth and width; stem medium length, slender; basin open, medium depth, nearly smooth; calyx partly open; pale yellow well washed with crimson; dots obscure; skin thin, tender; flesh dull white, rather coarse, tender, moderately juicy; core large; subacid, pleasant flavour, slightly Fameuse-like; quality good; season probably early September.

A handsome apple. Considered better in quality than Langford Beauty, as there is no astringency. Promising.

Thurso (Northern Spy Seedling).—Above medium size; roundish, angular; cavity medium depth and width; stem medium length, slender; basin medium depth and width, wrinkled; calyx closed; pale, greenish-yellow, washed and splashed with red; dots few, small, pale, indistinct; skin moderately thick, moderately tough; flesh yellowish, firm, crisp, juicy; core large, open; subacid, sprightly, pleasant flavour; quality good; season probably late September and October or later.

A very promising apple, looking, smelling and tasting somewhat like Spy.

VARIETIES OF APPLES NOT WELL KNOWN IN THE PROVINCES OF ONTARIO AND QUEBEC.

There are three varieties of apples to which attention should be drawn this year, as they have attracted considerable attention in some parts of the country and should be better known. They are the Lowland Raspberry, Lubsk Queen, and Peerless. The following descriptions of tree and fruit were made from specimens grown at the Central Experimental Farm:—

Lowland Raspberry (Livland Raspberry).—This variety is a native of Russia, and has been grown at the Central Experimental Farm since 1888. The tree is very hardy, and is a strong, moderately upright grower and a medium to good bearer.

Fruit medium to large; roundish to oblate conic, angular; cavity medium depth, narrow; stem medium length to short, moderately stout; basin shallow, narrow, slightly wrinkled; calyx closed or partly open; pale yellow, waxy, more or less blotched, splashed and washed with bright red; dots few, pale yellow, indistinct; skin moderately thick, tender; flesh white tinged with red, crisp, tender, juicy; core medium to large, open; subacid, pleasant, good flavour; quality very good; season mid to late August.

One of the best summer apples, especially for home use, but drops badly and ripens unevenly. Preferable to Red Astrachan in colder districts.

Lubsk Queen.—Originated in Russia and introduced into the United States in 1870. Planted at the Central Experimental Farm in 1892. Tree hardy, and an upright, moderately vigorous grower and a medium to good bearer.

Fruit above medium size; roundish, somewhat angular, flattened a little at ends; cavity shallow, medium width, russeted; stem short to medium, stout; basin open, medium depth, wrinkled; calyx open or partly open; pale yellow, almost white, waxy, well washed with bright, lively red; dots moderately numerous, yellow, indistinct; bloom bluish, noticeable; skin with smooth surface, moderately thick, tender; flesh white, tinged with red near skin, firm, juicy; core medium; subacid, pleasant flavour; quality above medium; season late August to early September.

A very handsome apple not unlike Red Astrachan in appearance, but skin more waxy, also somewhat resembling Lowland Raspberry. Handsomer than either Lowland Raspberry or Red Astrachan, but not so good in quality. Should ship better than either.

Peerless.—Originated at Richland, Minnesota, in 1864. The Peerless has lately come to the front in some sections, its handsome appearance having drawn considerable attention to it. It has been tested at the Central Experimental Farm since 1900. The young trees are very handsome in appearance and are strong growers. In the winter of 1905-6 several of the trees which before were in good condition were winter killed, the trunk being the part affected. While the winter of 1905-6 was unusually cold, care should be taken in planting Peerless where the winters are as severe as at Ottawa. In Minnesota, where this variety has been tested for a long time, it is not a general favourite, being found a shy bearer. The fruit as grown at Ottawa was described as follows:—

Fruit large; oblate; cavity open, medium depth; stem short, stout; basin deep,

medium width, almost smooth; calyx open; yellow, well washed with crimson and splashed with darker shades; dots few, white, distinct, not prominent; skin moderately thick, moderately tender, somewhat oily; flesh dull white, tinged with red about core line, rather coarse, moderately juicy; core medium; subacid, pleasant but not high flavour; quality above medium; season October and November.

An attractive loooking apple, but not desirable for dessert as flesh is not good. May sell well.

A CLOSELY PLANTED WEALTHY APPLE ORCHARD.

The small, closely planted orchard of Wealthy apple trees at the Central Experimental Farm, planted in 1896, continues to give good returns. This orchard occupies about one-third of an acre. The trees were originally ten by ten feet apart or 435 trees to the acre. A few of the trees have died, and seven were removed in 1907, being the beginning of the thinning which will now have to be done from time to time. The number of trees remaining is 122. Details regarding the returns from this orchard and the expenses in connection with the same were published in the Annual Reports for 1902, 1904 and 1905. In the spring of 1906 about one-half of the trees were headed back severely to admit more light and air, the other half having been pruned in a similar manner the previous year. The orchard was manured in December, 1904, and received another good top dressing of fresh barnyard manure in the winter of 1907-8, which will be charged against the returns for 1908. The crop in 1906 was a medium one, and that in 1907 rather light. The trees, on the whole, are healthy and vigorous and the orchard promises well.

Following are statements of yields, sales and expenses for years 1906 and 1907:—

WEALTHY ORCHARD, 1906.

		Estimated per acre.
Fruit picked..	450 gallons.	57 barrels.
Windfalls..	436 "	55 "
Total..	886 " (37 brls.)	112 "

WEALTHY ORCHARD, 1906.

Sales of Fruit from Closely Planted Wealthy Orchard, 1906.

			Estimated per acre.
Sold 17 baskets	at 20c..	$ 3 40	$10 28
" 26 "	25c..	6 50	19 66
" 69 "	27½c..	18 97	57 38
" 161 "	30c..	48 30	146 11
" 40 "	32½c..	13 00	39 32
" 10 "	35c..	3 50	10 59
Total 323 baskets.		$93 67	$283 34

Expenses, 1906.

323 baskets and covers at $5.25 per 100.	$16 96	$51 30
Commission on sales.	9 37	28 34
Rent of land.	99	3 00
Spraying 4 times.	3 58	10 77
Picking fruit, 108 hrs. at 15c.	16 20	49 00
Packing fruit.	4 80	14 52
Pruning, 30 hrs. at 15c. per hour.	4 50	13 61
Total.	$56 40	$170 54
Net profit, 1906.	$37 27	$112 80

WEALTHY ORCHARD, 1907.

		Estimated per acre.
Fruit picked.	441 gallons.	56 barrels.
Windfalls.	152 "	19 "
Total.	593 " (25 brls.)	75 "

WEALTHY ORCHARD, 1907.

Sale of Fruit from Closely Planted Wealthy Orchard, 1907.

		Estimated per acre.
Sold 20 baskets at 17½c.	$ 3 50	$10 59
" 53 " 20c.	10 60	32 06
" 76 " 22½c.	17 10	51 73
" 77 " 25c.	19 25	58 23
Total 226 baskets.	$50 45	$152 61

Expenses, 1907.

226 baskets and covers at $5.75 per 100.	$12 99	$39 29
Commission on sales.	5 04	15 25
Rent of land.	99	3 00
Spraying 4 times.	3 64	11 01
Picking fruit.	6 75	20 42
Packing fruit.	3 38	10 22
Pruning.	3 75	11 34
Mowing in orchard.	1 50	4 54
Total.	$38 04	$115 07
Net profit, 1907.	$12 41	$37 54

The above yields, receipts and expenditures are estimated from about one-third of an acre (40/121), and the estimated figures per acre are given on the assumption that the percentage of sales would be the same from a full acre. A record is kept of the time spent in caring for this orchard. Labour is valued at 15 cents per hour. This orchard is not cultivated, and the grass that grows in it is either cut and not removed or left to die down and rot.

Close planting such as is here reported upon is not recommended for the average farmer, but for fruit specialists it promises to be a more remunerative method for growing early bearing varieties than planting them at the regular distances of thirty

to thirty-six feet apart. It will probably pay more to plant trees close in the north than in the more southern fruit districts. A method of close planting suggested for the best apple districts is to have the permanent trees thirty-six to forty feet apart each way, with early bearing varieties between, and with additional rows of such between the permanent rows, making all the trees eighteen to twenty feet apart each way at the beginning, with the idea of cutting out the early bearing sorts in fifteen to twenty years.

PLUMS.

The crop of plums was only a medium one in 1907, and the fruit not as large as it sometimes is, owing to the comparatively dry season. Most of the fruit was from the Americana and Nigra varieties, but fair crops were obtained of the Domestica plums, Bonne Ste. Anne, Reine Claude de Montmorency, Quebec, and Mount Royal. The Americana and Nigra plums continue to sell well on the Ottawa market, and up to the present time they are decidedly the most reliable plums for eastern Ontario and most of the province of Quebec.

CHERRIES.

Cherries do not bear regularly in the Ottawa district, and are quite unprofitable to grow for commercial purposes. In 1907 there was a medium to good crop of some varieties. The cause of the failure of cherries to fruit regularly is the winter killing of the fruit buds. In winters when the temperature does not often go below 20° F. below zero the fruit buds are not injured so much as when there are long spells of very cold weather.

Prunus Tomentosa—DOWNY-LEAVED CHERRY.

A very interesting and what promises to be a useful fruit in some parts of Canada is *Prunus tomentosa,* a native of North China, Manchuria and Japan. This tree is closely related to the apricot, and belongs to the sub genus Armeniaca. The fruit resembles a cherry very much both in appearance and taste. Seed was obtained from the Arnold Arboretum, Jamaica Plain, Mass., U.S., by the Director, and planted at the Experimental Farm. In 1900 the trees were set out, and they began fruiting in 1903. The trees or bushes, as they really are, have proved quite hardy, and while the flower buds do not escape injury every winter, as a rule at least part of them do. The bush is comparatively low-growing and the fruit borne almost to the ground, so that a large proportion of the fruit buds are usually protected by snow. The leaves are broad-oval in shape, narrowing abruptly near the apex to a point. They are somewhat dull in colour, wrinkled above and quite downy or tomentose on both sides, as are also the twigs. The margins of the leaves are serrated. The flowers are white or pinkish, and are borne singly or in groups of two to five on last year's wood. They have very short stems or are almost sessile. The fruit ripens at Ottawa during the latter part of July. Following is a description of it:—

Prunus tomentosa.—Roundish or globular, slightly heart-shaped; half an inch in diameter; cavity medium; stem very short; suture a rather indistinct line; apex rounded or almost flat; bright scarlet; no dots; no bloom; skin slightly hairy, thin, tender; flesh tender, juicy; stone small, oval, almost free; subacid, slightly astringent, pleasant flavour; quality above medium, almost good.

Fruit separates readily from stem. Very easily picked. Stem remains on bush. The seedlings of *P. tomentosa* vary considerably. The seedling described is one of one of the best of them.

When canned the fruit of *Prunus tomentosa* is quite pleasant to the taste, reminding one of sweet cherries, while the stones which are left in owing to the small size of the fruit give a distinctly pleasant flavour to it.

While this fruit may not be grown where the ordinary cherries will succeed, it should prove quite useful in the colder parts of the country, especially where there is a good depth of snow to ensure regular crops.

GRAPES.

The grapes looked well in 1907, and the vines bore large crops of fruit in most cases, but the cool weather of autumn prevented most kinds from maturing. There were twenty-six sorts which ripened thoroughly and a number of others which became nearly ripe. After testing many varieties of grapes at Ottawa about twenty-five have been found which will ripen thoroughly every year. Some of the surest kinds to ripen, and hence the most useful for the coldest districts, are Hartford, Jewel, Early Ohio. Early Daisy, Champion, Manito, Pattison, Moore's Early, Golden Drop, Moyer and Brant. Other and better kinds which will be found in the list of varieties of fruits recommended in this report may be grown where the climate is about the same as at Ottawa. Grapes should be covered with about six inches of soil just before winter sets in in cold districts, but the time when the vines are likely to be injured is in the spring after they have been uncovered, hence they should be left covered until the buds begin to push, or about the middle of May, to avoid spring frosts.

One of the most promising of the newer grapes which ripen at Ottawa is the Yomago, originated by T. V. Munson, Denison, Texas, a description of which as it grows at Ottawa is as follows:—

Yomago (Delago x Brilliant).—The parentage of Delago is Delaware x Goethe, and the parentage of Brilliant is Lindley x Delaware, so that the Yomago has the blood of the Lindley, Delaware and Goethe in it.

Vine a medium grower and moderately productive. Bunch below medium size, little if at all shouldered, compact. Fruit below medium size, larger than Delaware, translucent, red with whitish bloom. Skin moderately thick to thin, tough; pulp melting. Sweet, pleasant flavour, much like Delaware.

The Yomango resembles Delaware very much, but is larger. It is as good a dessert grape as Delaware, and its larger size gives it an advantage. It promises to be as productive as Delaware or more productive. It is a few days later in season at Ottawa.

BUSH FRUITS.

During 1907 a bulletin was issued on bush fruits, in which was given much of the information obtained after twenty years' experience with raspberries, currants, gooseberries and blackberries. The best methods of cultivation were given, descriptions of a large number of varieties published, and the best ones recommended. There was also published in this bulletin a history of the work done by Dr. Wm. Saunders in breeding bush fruits.

Descriptions of the most injurious insects were contributed by Dr. James Fletcher. There was also a spraying calendar in the bulletin, with directions for spraying to control injurious insects and fungous diseases.

The crop of currants was a good one in 1907; raspberries medium; gooseberries light, and blackberries light. The currant bushes in the new plantation made in the spring of 1907 are well established.

STRAWBERRIES.

The strawberries came through the winter of 1906-7 well, although the crop was but a medium one, as both the seasons of 1906 and 1907 were too dry for best results with strawberries.

Notwithstanding the large number of new varieties which are offered for sale every year the number of really good new kinds is very small. In fact, there are almost no changes to make in the list of varieties recommended five years ago, the same kinds still proving among the most productive. Following are descriptions of twelve of the most productive and best kinds, arranged in alphabetical order:—

Beder Wood (Racster), Per.—Originated by Beder Wood, Moline, Ill., from seed sown in 1881 and fruited in 1883. Introduced about 1890.

Fruit round conical, medium size, pale red, not prominent seeds; flesh pale, juicy, acid, moderately firm, medium quality; season early to extra early; plant vigorous; runners numerous; foliage moderately good; rusts considerably. Promising on account of earliness, productiveness and for being a good pollinizer.

Bisel (Imp.)—Originated by D. L. Bisel, Southern Illinois in 1887; a seedling of Wilson.

Fruit roundish, large, bright red, handsome with rather prominent seeds; flesh bright red, juicy, inclined to be hollow, briskly subacid, moderately firm, above medium quality; mid-season; plant vigorous; runners numerous; foliage moderately good, but rusts considerably.

Productive and handsome; one of the most attractive berries.

Buster (Imp.)—Originated by C. C. Sto[illegible] Moline, Ill. A cross between Bubach and Sharpless.

Fruit roundish, large, bright, rather pale red, not prominent seeds; flesh bright red, juicy, briskly subacid, moderately firm, medium to above in quality; season medium late to late; plant vigorous with medium number of runners; foliage good, but rusts considerably. Very promising. As firm as Clyde and brighter red. Keeps its size well to the end of the season. Foliage is good and shades the fruit well.

Enhance (Per.)—Originated by Henry Young, Ada, Ohio. A cross between Sharpless and Windsor Chief.

Fruit roundish or roundish conical, above medium to large, deep red, not prominent seeds; flesh bright, rich red, meaty, subacid, firm, above medium to good in quality; medium season; plant vigorous, large number of runners; foliage moderately good, rusts considerably.

A fine, productive berry.

Glen Mary (Per.)—Originated by Mr. Jugham, West Chester, Pa. Introduced by W. F. Allen, jr., in 1896.

Fruit irregular, roundish to wedge conical, very large to large, deep red at base becoming pale towards tip, seeds not prominent; flesh bright red, juicy, rather watery; subacid, moderately firm, of medium quality; medium season; moderately vigorous, runners numerous; foliage moderately good to good; rusts considerably.

A good cropper and keeps its size well to the end of the season.

Greenville (Imp.).—Originated by E. M. Buechly, Greenville, O., in 1883. Introduced in 1893.

Roundish to wedge shaped, large to very large, bright red; flesh bright red, juicy, subacid, pleasant, moderately firm to rather soft, good quality; vigorous, runners numerous; foliage good; rusts slightly to considerably.

A very productive berry.

Lovett (Per.)—Originated in Kentucky by J. H. Morris in 1885. Introduced by J. L. Lovett, Little Silver, N.J., in 1890. A cross between Crescent and Wilson.

Fruit pointed to wedge conical, above medium size, bright red, glossy; flesh bright red, juicy, acid, moderately firm, and above medium in quality; season early to medium; plant vigorous, few runners; poor to moderately good foliage, rusts considerably to badly.

Sample (Imp.)—Found growing in an old bed of Leader in 1894 by J. D. Gowing, of Massachusetts. Introduced in 1898 by C. S. Pratt, Reading, Mass.

Fruit pointed conical, very regular in shape; above medium to large, bright or rather deep glossy red, seeds fairly prominent; flesh bright red, juicy, almost watery, core has a slight hardness, subacid, moderately firm; medium quality; season medium to late. Plants vigorous, large number of runners; foliage moderately good to good, rusts considerably. Handsome and productive.

Senator Dunlap (Per.).—Originated by J. R. Reasoner, Illinois. Named in 1899, and introduced by M. Crawford in 1900.

Fruit pointed, wedge, and long wedge conical; medium to large in size; deep, glossy red; seeds not especially prominent; flesh rich red, juicy, tender, briskly subacid, moderately firm; above medium quality; season early. Plants vigorous, large number of runners; foliage moderately good, rusts considerably.

Handsome and productive.

Splendid (Per.).—Originated by C. H. Sumner, Stirling, Illinois. Fruit roundish; medium to large; deep red; seeds not prominent; flesh red, juicy, moderately firm; quality above medium; early to medium in season. Plants vigorous, making numerous runners; foliage moderately good.

A productive early variety, good for preserving.

Warfield (No. 2) Imp.—Originated with B. C. Warfield, Sandoval, Illinois. A supposed cross between Crescent and Wilson. Pointed conical; medium to above medium size; deep red, glossy; rather prominent seeds; flesh deep red, juicy, acid, moderately firm; medium quality; early to medium season. Plants vigorous, large number of runners; foliage moderately good, rusts considerably to badly. A handsome berry and a good cropper.

Williams (Prince of Orange), Per.—Wedge conical, large, bright rather deep red with a white tip, rather prominent seeds; flesh bright red, juicy, subacid, good flavour, firm; quality good; medium season. Plants vigorous, large number of runners; foliage moderately good, but considerable rust.

One of the best varieties for distant market.

Originated with Mr. Williams, Burford, Ont. A cross between Crescent and Sharpless. Introduced by Daniel Greig, Cainsville, Ont., in 1891.

Additional productive varieties of merit are: Marie (imp.), Barton's Eclipse (imp.), Daisy (imp.).

VARIETIES OF FRUITS RECOMMENDED FOR EASTERN ONTARIO AND QUEBEC SOUTH OF LATITUDE FORTY-SIX DEGREES.

Apples—Commercial and Domestic—
- Summer—Transparent, Lowland Raspberry, Duchess.
- Autumn—St. Lawrence, Wealthy, Alexander.
- Early winter—McIntosh, Fameuse, Wolf River.
- Winter—Milwaukee, Baxter, Scott Winter.

Additional varieties suggested for domestic use—
- Summer—Langford Beauty.
- Autumn—Peach of Montreal, McMahan.
- Winter—Swayzie, Pewaukee, Golden Russet, Rufus.

Crab Apple—Domestic—
- Whitney, Martha, Hyslop.

Blackberries—Domestic only—
- Agawam, Snyder.

Cherries—Domestic only—
- Orel 25, Vladimir, Minnesota Ostheim, Cerise d'Ostheim.

Currants—Commercial and Domestic—
- Black—Saunders, Kerry, Clipper, Eclipse, Climax, Collins Prolific, Black Victoria.
- Red—Pomona, Victoria, Red Dutch, and Wilder in most favoured parts.
- White—White Grape.

Gooseberries—Commercial and Domestic—
- Pearl, Downing and Red Jacket.

Grapes—
Black—Early Daisy, Manito, Moore, Worden, Wilder.
Red—Moyer, Brighton, Delaware, Lindley.
White—Golden Drop, Winchell, Diamond.

Pears—Commercial and Domestic—
Flemish in most favoured parts.

Plums—Commercial and Domestic—
Americana and Nigra—Aitkin, Bixby, Mankato, Cheney, Wolf, Admiral Schley, Brackett, Hawkeye, Stoddard.
European and Domestic—Early Red (Russia) Mount Royal, Raynes, Glass, Montmorency, Perdrigon.

Raspberries—Commercial and Domestic—
Black—Hilborn, Older.
Red—Marlboro, Herbert.
Yellow—Golden Queen.

Strawberries—Commercial—
Beder Wood (per.), Splendid (per.), Warfield (imp.), not suited to light soil; Greenville (imp.), Pocomoke (per.), Sample (imp.), Buster (imp.).
Domestic—Excelsior (per.), Splendid (per.), Senator Dunlap (per.), Lovett (per.), Bubach (imp.), Belt (per.).

WINTER INJURY TO FRUIT TREES—TEN DIFFFERENT WAYS IN WHICH TREES ARE AFFECTED.

During the past twenty years much experience has been had at Ottawa in winter injury to fruit trees, and the observations which have been made during that time and the conclusions drawn and recommendations made are now summarized, in the hope that much injury will be prevented by adopting the best methods. It would appear that there at least ten distinct forms of winter injury.

If one could make an accurate estimate of the number of fruit trees which have been winter killed in the colder parts of Ontario and the province of Quebec the figures would be astounding, they would be so large. Trees which were killed the year after planting; trees that were killed just when they were beginning to bear fruit; and trees which were in their prime and bearing bountiful crops, all have suffered. This terrible destruction from winter has caused great discouragement among the people and has been one of the chief causes of the slow development of the fruit industry in the colder parts of Canada.

Much of this loss could have been avoided if the hardiest trees only had been planted, but how few there are who know the details connected with the establishment and maintenance of an orchard and who know there is almost or quite as much difference in the hardiness of varieties of fruits as there is between the hardiness of the tenderer and hardier kinds of vegetables. All farmers have learned by observation that with a very slight frost potato tops will be killed, but that it will take a much lower temperature to kill a cabbage. But the cause of death in fruit trees still continues to be a very mysterious thing to most farmers who, when a tree has been root killed, for instance, sees it leaf out and bloom but eventually wilt under his very eyes during the summer without any apparent reason. Unfortunately this lack of knowledge on the part of the farmer has been taken advantage of by unscrupulous men and farmers have been urged to buy the varieties of fruits which appeal to them most strongly in the coloured plate or from the glowing description given by the agent. Of late years our best nurserymen seem to be impressing upon their agents the importance of offering only those varieties suited to the district in which they are sold and we have been very pleased to have these agents call upon us at the Central

Experimental Farm and get what information we could give them on the fruits most suited for the districts they were working in. For a long time it was not known what varieties of fruit were hardy in the different parts of the provinces of Ontario and Quebec, but experience has taught which will succeed and the results of this experience have been recorded. With the literature now available and the information which may be obtained by applying to the proper authorities, there is no reason why any one should plant varieties which will not succeed with him, provided he has the proper soil in which to grow them and gets good trees and looks after them properly.

The forms of winter injury which will be discussed here are, root-killing, bark-splitting, trunk-splitting, sunscald, trunk or body injury, crotch injury, killing-back, black-heart, killing of dormant buds, killing of swollen buds.

Root-killing.—Root-killing is caused by the exposure of roots to severe frost and by the alternate thawing and freezing of the roots. It is most prevalent in winters when the soil is dry and when there is little or no snow. It is of very common occurrence in Manitoba and the Northwest provinces and in the states of Nebraska, Iowa, Minnesota and Dakota. Roots are in many cases tenderer than the tops and are sometimes killed when the tops remain uninjured. Some valuable experiments were conducted by the Nebraska Agricultural Experiment Station to determine the conditions under which root-killing occurred. Trees were planted in boxes 2 feet square and 18 inches deep, each box having 25 young apple trees. Six boxes were left outside about the middle of December with soil having different percentages of moisture. One box was covered with a mulch of straw about 4 inches deep. One was kept covered with about 4 inches of snow whenever snow fell. The remaining boxes were left without any covering, any snow which fell being swept off. The trees were examined in February when out of 25 apple trees set in the unprotected box containing 10·4 per cent of moisture the roots of 20 trees were dead and the remaining 5 uninjured. In the unprotected box containing 15·2 per cent of moisture, 19 trees were dead and 6 injured. In the box with a moisture content of 19·8 per cent, 3 were dead, 10 injured and 12 uninjured. In a box with 25.6 per cent moisture 8 trees were dead, 4 injured, and 13 uninjured. The box covered with the straw mulch contained 16 per cent of soil moisture and none of the trees were dead in this box, and but 7 injured. In the box covered occasionally with snow and containing 15·8 per cent moisture 7 were dead and 8 injured. Not a root was injured in a box stored in a cool, dry cave, though it contained but 10 per cent, soil moisture. These figures are very striking. The fact that the trees kept in a cool, dry cave were uninjured was believed by the experimenters to prove that cold as well as dryness was necessary to cause the death of the roots, which is borne out by our own experience. The fact that the injury was found to be so great in the dry soil would appear to show that the dry, cold air entering the soil killed the roots by dry freezing and that in the soils which were moist even thawing and freezing would not destroy them. As the soil in the provinces of Ontario and Quebec is usually moist in the autumn and further drying out is usually prevented by a covering of snow, root-killing does not often occur, there having only been three times during the past twelve years when there has been much injury. This infrequency of root killing is, however, liable to make fruit growers careless, and a time comes when an orchard is just in its prime when the trees are swept out by root-killing to the owner's great disappointment and discouragement. What, then, are the preventives of root-killing?

At the Central Experimental Farm, Ottawa, many trees were root-killed in the winter of 1895-6, a winter when there was little snow. At that time cover crops were not used to any extent and the soil at the farm was bare. Since that time great care has been taken to have a cover crop in the orchard before winter sets in. This cover crop in itself protects the roots of the trees from drying out and helps to hold the snow for further protection. While the roots of trees in sod are protected by this sod and may not be killed when those under cultivation are, it may happen that in some cases the soil is so dry under the sod that if there is no snow the roots may yet be killed. The mulching of the ground about trees with straw or manure will also

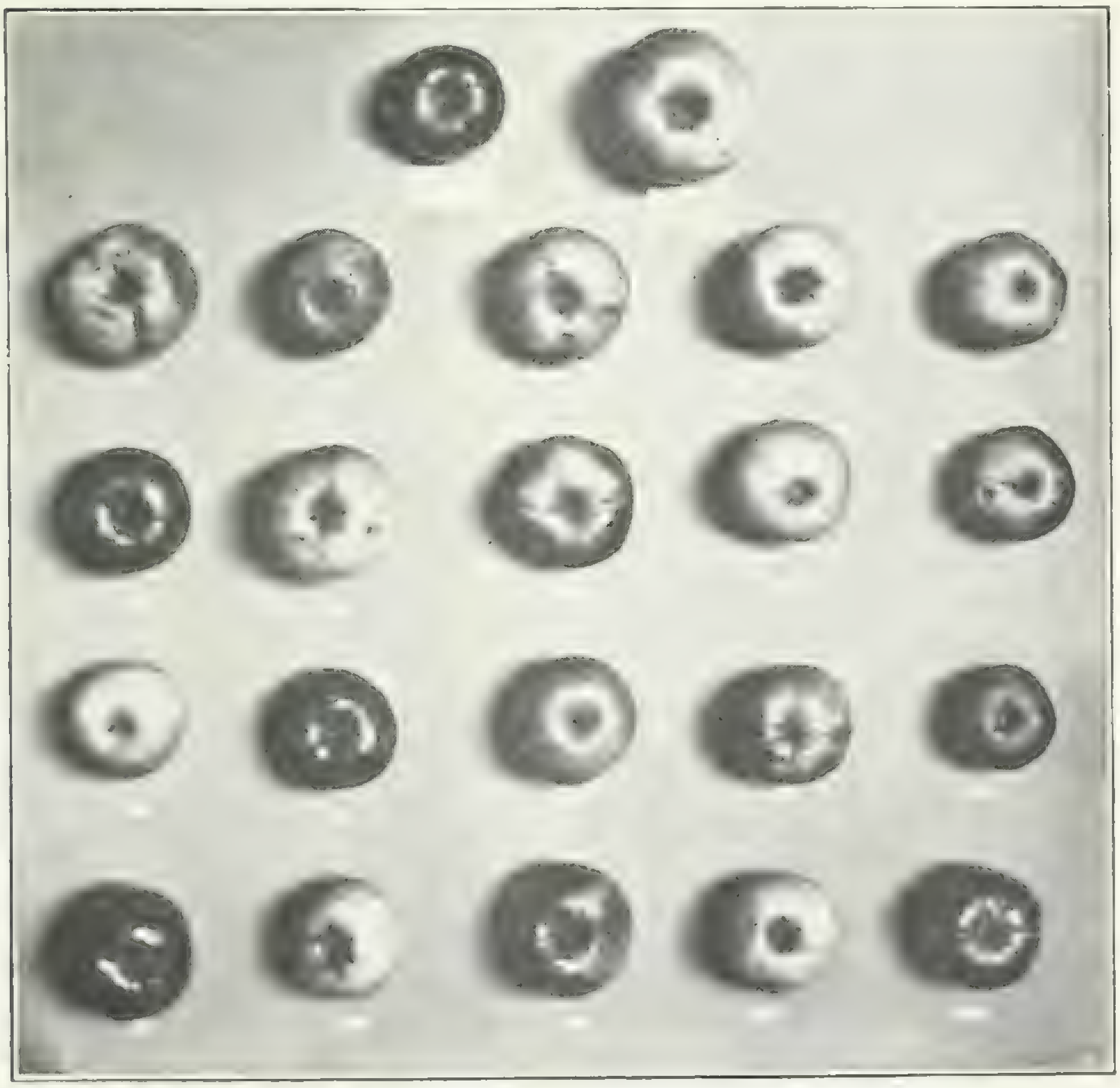
protect the roots from injury. Another reason why we have not been troubled with root-killing during the past twelve years at Ottawa is that practically all our grafted trees have been since that time grafted on crab apple roots, not on Pyrus baccata, although some are on this stock, but on the seedlings of Martha, Transcendent, and other cultivated varieties. The apple seedlings used by nurserymen for stocks vary much in hardiness. Every tree probably differs more or less and some are undoubtedly quite tender. The result is that varieties otherwise hardy, when grafted on these roots, fail. Seedlings of the crab apples are much more likely to be hardy, and we believe that if some nurseryman would make a specialty of growing the apples suitable for the colder parts of Ontario and the province of Quebec, on crab apple stocks, he would in time sell a large number of these trees. The advantage of crab apple roots has been very marked in the Northwestern States where trees on ordinary apple stocks have been killed out, while those on crab roots were uninjured.

Bark-splitting.—This is an injury which usually occurs on young trees. It is due to the expansion caused by frost when trees are in a very succulent condition. It occurs when trees have grown late in the fall and there is a sudden low drop in temperature. It will occur when trees have grown late and there is a heavy fall of snow before the ground freezes. The soft snow appears to soften the bark of the tree and when the temperature drops suddenly the moisture under or in the bark expands and loosens the bark from the trunk or kills the cambium. In Nova Scotia the Gravenstein and other apples are affected with what is known there as 'Crown rot,' which apparently destroys the bark about the tree near the ground. From what we can learn of this injury, which occurs mostly in well cultivated orchards, and in moist ground, we believe that the cause is that the Gravenstein grows too late and is subjected to the conditions just referred to, namely, of being too full of sap. Traces of disease have been found at these injured parts but we believe that the disease is secondary rather than the principal cause, though we have not had an opportunity to study the injury there. Bark splitting can be prevented to a large extent by having the wood of the trees well ripened when winter sets in, and this can be brought about, usually, by stopping cultivation in good time. When young trees are injured by bark splitting they may be saved if not too badly hurt by covering the injured parts with grafting wax.

Trunk Splitting.—Trunk splitting, while not a common injury in orchards, is not rare. It was long thought to be due to the expansion of trees which had been 'hide-bound.' We do not believe that there is such a thing as a 'hide-bound' tree. While so far as is known no experiments have been tried to determine the cause of trunk splitting, yet several theories have been advanced, the best one being that the splitting is due to a sudden lowering of temperature which cools the outside layers of wood in the trunk, making a considerable difference in temperature between the outer and inner layers, causing the former to contract. A clearer example is the cracking of ice when there is a sudden fall of temperature, due to the contraction caused by the upper layers of ice coming in contact with the cold air. It is trees which have made late growth and are well charged with sap that are usually affected, hence thorough ripening of the wood is necessry for the prevention of this injury also.

Sunscald.—The injury to apple trees known as sunscald is one of the most serious hindrances to successful apple culture, particularly in the northern and eastern parts of Ontario and in the province of Quebec. Newly planted or young trees are, as a rule, more seriously affected by it than older ones. The unhealthy appearance of the bark on the south and southwestern sides of the trunk of the tree and on the larger branches is the first indication of this injury. Afterwards the bark and wood dry up and fall away. Trees are often so badly affected that they die. Sunscald occurs during the latter part of winter or very early in the spring when there are warm days and cold nights. The results are apparently the same as what happens when many plants are thawed out suddenly: they die. In the case of the apple tree,

Downy-leaved Japanese Cherry. (Prunus tomentosa, Ottawa, Ont.)



McMahan (female) x Scott Winter (male) apples. The parents and twenty of the crosses, Ottawa, Ont.

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only a part of the trunk is thus affected, being that part which is exposed most to the sun. The constant thawing and freezing is more than it can stand. The hardiest varieties are the least affected. The injury may be prevented to a large extent by only planting trees which are headed low, thus exposing but a short trunk to the rays of the sun; also, by inclining the young trees somewhat to the southwest when planting, thus preventing the sun's rays from striking the trunk except for a short time each day. When trees have been planted and are liable to become sunscalded the trunks may be protected by using a veneer of wood which encircles the trees, thus preventing the rays of the sun from striking the trunk. The protector is better loose so that there will be an air space between it and the tree. White building paper tied around the tree is also useful. Boards, sacking and many other things may be used to protect the tree from sunscald. Nothing, however, that will be likely to harbour mice should be used.

Crotch injury.—The effects of crotch injury have been very serious in the province of Quebec and in some parts of Ontario in recent years. On examination it is found that in the centre of the crotch and on the branches diverging from it, but close to it, the bark is dead. As a result of this killing in the crotch the tree loses its strength there, rot sets in and eventually the tree is destroyed by the loss of one limb after another at the crotch. This crotch injury is probably due to ice lodging in the crotch. There are several theories as to why the ice should cause the bark to die. One is, that it acts as a lens and concentrates the rays of the sun, causing a scalding of the bark. The position of the injured limbs alone would seem to be sufficient to show that this theory is not a good one. It seems more likely that the injury is caused by the softening of the bark by the melted snow or water before freezing, and that after freezing the bark which is, even before this probably tenderer than at any other part, owing to its being most shaded there in summer, is subjected to a severe frost and it and the cambium are both destroyed. One of the best means of preventing crotch injury is to grow trees with as little crotch as possible, training with a central leader. Further investigation may show that the fire blight disease and one or more of the canker diseases cause injury in the crotch.

Killing-back.—This is the indication of inherent tenderness of the variety, or of immaturity of wood. Plants which need a long season in which to mature their wood will go on growing so late when cultivated in a climate having a shorter season that their wood is not matured and the young wood or the whole tree may be killed. When the wood of a tree which would otherwise prove tender is well ripened it will often survive, but there are fruits and varieties that will stand only certain minimum temperatures, after which their protoplasm or life is destroyed. It sometimes happens that varieties of fruits which are apparently hardy will survive until after a heavy crop followed by a severe winter when, owing to lowered vitality, they will be destroyed. The Ben Davis apple is an example of this. As has been said, killing back may be due to the immature condition of the wood, or it may be due to the death of the protoplsam. When winter killing is due to immaturity of wood it may be prevented to a large extent by methods of cultivation. From experiments conducted at Ottawa by the chemist, Mr. Frank T. Shutt, it was found that varieties of apples which were known to be tender had usually more moisture in their twigs in winter than those which were hardier, partly owing, no doubt, to the fact that they were more immature than those of trees which were hardier. When trees of certain varieties are liable to be killed after heavy bearing, thinning of the fruit should be practised in order to prevent the lowering of vitality. The injury to branches of shrubs or herbaceous plants can often be prevented, as is well known, by thawing them out gradually, when the sap, which on being frozen is withdrawn into the intercellular spaces, will return to the cells whereas if thawed out quickly the cells might break down.

Black Heart.—Black Heart is a condition found in trees grown in cold climates. It is caused by the death of the alburnum or young wood in winter. The bark and cambium

remaining uninjured, growth continues in the spring much as usual, but the injury remains and may eventually cause the death of the tree. If, for instance, rot gains an entrance through the crotch or a dead branch the whole interior of the tree may rot and some day the tree will blow over and it will be found merely a shell which has been held together by the trunk and a few outside layers of wood. Black Heart in its incipient stage may be prevented by careful attention to northern grown nursery stock. During the winter after the first season's growth of the young grafted trees, most varieties are likely to be killed back, and when the tree begins to grow in the spring it will be found that the alburnum is blackened below the point where growth begins. This is Black Heart. Careful nurserymen now cut back the young trees almost or quite to the ground the first year, in order that the tree may start growth from healthy wood. The same thing may occur the second season, and the trees are again cut back, but it is usually not necessary to cut so far. Even after trees are three and four years of age and have been planted in the orchard they may get Black Heart by winter injury, but it is much rarer than when they are neglected in the nursery. The tenderer varieties are more susceptible to Black Heart than the hardy ones.

Trunk Injury—Body Injury.—The fact that trees lose moisture in the winter has been proved by careful experiments. In an experiment conducted at the Central Experimental Farm by Mr. Frank T. Shutt, Chemist, in the winter of 1902-3 to determine the moisture-content of apple twigs, it was found that during the depth of winter there was a gradual loss of moisture. Experiments at Cornell University and other places confirm this. In the Northwest, where the weather is very cold in winter and there are often no trees to check the force of the wind, trees lose so much moisture that it is a common occurrence for them to die simply from drying out. The same trees if protected by a good windbreak would in many cases not be injured. It has been written, although we are not sure that the figures are correct, that the same surface which would in calm weather exhale 100 parts of water would exhale 150 parts in a high wind. These proportions would probably be considerably less in the case of fruit trees protected by bark, but it shows what a drying effect wind has. The winter of 1906-7 was a very cold one in eastern Ontario and the province of Quebec, and there was considerable injury from body-killing. This, for the most part, took the form of trunk killing, the upper part of the trunk unprotected by snow being apparently dried out. The result was that the bark and cambium all around the trunk was killed. At Ottawa quite a number of trees was lost in this way. The reason, in our judgment, why the trunk was killed and the top uninjured was that the top had more moisture and was not dried out sufficiently to be killed. In past experience it has been noticed at Ottawa that sometimes the younger growth of apple trees will come through the winter uninjured, while the older parts of the branches will be killed. Trees in sod orchards will sometimes die from 'body killing' when those which are cultivated do not, the latter having more moisture. In a letter received from Mr. A. P. Stevenson, Nelson, Man., he writes:—'Outside of sunscald, our chief winter injury is killing back. This is serious when the following winter conditions prevail: Light snowfall, high winds and extremely low temperature continuing for some time. Some varieties are killed to the snow-line. Two years ago we had a winter like that. and another seven years previous to that. The trees were simply frozen dry.' There have been some indications at Ottawa that body-killing or trunk injury has occurred under the veneer protector. This may have been due to ice held about the tree too long by the protector.

Two means of prevention of body-killing may be mentioned. One, to see that the trees have made vigorous growth the previous summer, not forgetting, however, to have the wood well ripened. The second is to plant windbreaks to check the force of the wind. In the Northwest the trunks are sometimes protected by sacking or veneer. It is even suggested by those who live in the West to make a box around the trunk with about six inches space and fill it with soil.

Killing of dormant buds.—While the killing of dormant buds evidently comes about partly from the same cause as body-killing, namely, a drying out in cold weather, it is evident that buds are more tender than wood, and their life is destroyed at certain minimum temperatures. Not only are fruit buds destroyed when the twig is not injured, but leaf buds as well. The buds being more exposed to the air may dry out when the wood does not. In the province of Quebec and the colder parts of Ontario the buds of the European and Japanese plums, and cherries are nearly always injured more or less in winter. This seems undoubtedly to be due to the drying out of the twigs, for when these fruits are grown near bodies of open water in winter they do well. The marked success of Mr. Aug. Dupuis, and others, in growing the European plums along the Lower St. Lawrence is well known. But what are the conditions there? It is only within a comparatively short distance of the river that these fruits succeed. When we get further back from the river the buds are killed as in other parts of the province. The reason of the successful culture of plums and cherries is evidently due to the fact that from the water there rises in winter a fog which blowing over the land keeps the air moist enough to save the buds from death. It will be remembered that it required dryness with cold to kill the roots of trees. When the roots were moist they were little injured, even if exposed to the same temperature. Cherry, plum, and peach buds are not so well protected from cold, and hence are killed from dry freezing more readily than apples and pears. There is, as yet, no very practicable way to prevent this drying out of the fruit buds. The fact that the parts of the trees which are under the snow produce fruit when the parts which are exposed do not suggests the plan of bending over the trees so that they will be covered, which has been done successfully by some growers. Another plan which we think deserves further experiment is the low training of plums and cherries, growing them with horizontal arms, for instance, which would be under the snow. A third plan is the breeding of varieties having hardier fruit beds. This we believe should, and is being done. The Montreal seedling plums, such as the Mount Royal and Raynes, are examples of varieties with hardier buds.

Winter-killing of swollen buds.—During the latter part of winter when the sun is beginning to get strong and when some days are quite warm there is often a premature swelling of buds, especially of the cherry, plum and peach. This warm spell may be followed by cold weather and there may be several such changes before spring. The buds being swollen and more or less active are more subject to injury from frost and changes than the dormant buds and the result is that they are killed. Great injury is often caused in the peach districts by the killing of swollen buds, and in the province of Quebec injury to the buds of plums and cherry is no doubt done when they are in this condition. It was long thought that if the ground could be kept frozen about the trees it would prevent the buds from swelling as the roots would thus be kept in an inactive condition, but it has been proved over and over again that this has no effect whatever in delaying the swelling of the buds. The expanding of the willow buds in our swamps before ice is gone is a good example of how buds will develop while the roots may yet be in a frozen condition. There is sufficient sap in the tree to supply the buds and even the leaves when they first expand and when the temperature about the top of the tree is high enough growth begins. Swelling of buds can be prevented by bending over the trees as suggested to prevent killing of dormant buds, but this could not very well be done on a large scale. A few years ago experiments were conducted at the Missouri station to determine if whitewashing the trees would retard the buds, the principle being used that white surfaces do not absorb heat as readily as darker ones. It was found that the whitewashing did retard the buds and in the case of peaches would sometimes prevent injury from frost. An experiment was tried at Ottawa in whitewashing plums and cherries, and it was found that it retarded the swelling of the buds. This means of prevention is not, however, a very practicable one as it is difficult to get the whitewash to cover the branches well for a long period. After further investigations at the Missouri station, it was found that

the buds of varieties of peaches having the lightest coloured twigs required higher temperatures to cause them to swell than those with darker coloured twigs, and the former suffered less from killing than the latter. Not having in these lighter twiged varieties the kinds of peaches required for commercial purposes the Missouri station is now at work breeding good varieties with light coloured twigs.

VEGETABLES.

Experiments with vegetables have always been an important part of the work of the Horticultural Division, and in carrying on this work the needs of the farmer, townsman and market gardener have been considered.

The question of varieties is one which is of interest to every one who grows vegetables. The varieties offered for sale by seedsmen have been carefully tested, and lists of the best published from time to time. At present the variety testing is for the most part confined to those which have given the best results in the past and to novelties for comparison with them. There have been cultural experiments tried with different kinds of vegetables, spraying for fungous diseases, selections for improvement in seed, and other lines of work some of which have been reported on from time to time. In this report space will not permit of recording the experiments with all the vegetables, those published being with potatoes and lettuce.

Lettuce.—There is no salad plant so popular in Canada as the lettuce, and fortunately owing to the ease and quickness with which it may be forced, good lettuce can be obtained throughout the winter. But as the use of lettuce is not confined to the winter and spring months, it is important to know which varieties will stand the heat of summer best. For many years experiments with varieties of lettuce have been conducted at the Experimental Farm, but during the last three years especial attention has been given to the testing of those kinds which from previous experiments had been found to be the best, the object being to learn which would be tenderest and remain in condition longest during the warm weather. The following table gives the information obtained.

Lettuce for summer use should be sown in rich, moist, cool, well prepared soil. The seed may be sown any time after the soil is dry enough to work in the spring. It takes from eight to nine weeks from the time of sowing until the plants are ready for use. The seed need not be sown very thickly to have good plants. The rows should be from twelve to fifteen inches apart. When the plants are large enough to be grasped between the thumb and finger they should be thinned to about six inches apart, after which they will need little attention except to keep the surface soil loose and free of weeds, which is important to secure rapid growth. Young plants may be readily transplanted if so desired.

There are two different types of lettuce grown, the Cos and the Cabbage. The Cos lettuce has an elongated and more upright growth than the Cabbage. It does not succeed so well in this country as in Great Britain, going to seed too rapidly, especially in summer. It is a very tender lettuce, but to get best results the leaves should be tied together to encourage blanching. The most satisfactory varieties of Cos lettuce tested at Ottawa are the Paris and Trianon. The Cabbage lettuce are those usually grown in this country. They have a more or less rounded form. The leaves are either curled or not. They may be divided into two groups, namely, the loose-growing curled varieties, among which are the best forcing kinds, and those which form heads, whether they are curled or not.

EXPERIMENT TO DETERMINE BEST VARIETIES OF LETTUCE FOR GARDEN CULTURE IN SUMMER.

Name.	Average number of days to reach condition for use.	Average number of days remaining in condition for use.	Notes on Varieties.
	3 years, 1905-7.	3 years, 1905-7.	
1 Iceberg	59	25	1 A curled headed lettuce. One of the best.
2 Hanson	59	25	2 One of the best heading varieties; not curled.
3 Giant Golden Hearted	60	24	3 Resembles Iceberg and Giant Crystal Head.
4 Giant Crystal Head	58	23	4 Cannot be distinguished from Iceberg.
5 Crisp as Ice	59	21	5 Leaves with a purplish tinge. Heads well. Very tender. One of the best.
6 New Morse	58	20	6 A curled lettuce somewhat resembling Black Seeded Simpson, but heading better.
7 New York	67	19	7 Leaves deep green, slightly curled. Heads well. One of the best.
8 Black Seeded Simpson	59	17	8 A reliable early, curled variety. One of the best for forcing.
9 Grand Rapids	57	15	9 A distinct, early, curled variety. The best for forcing.
10 Silver Anniversary	61	15	10 Heads well. Leaves uncurled.
11 All Heart	59	15	11 Resembles Black Seeded Tennis Ball somewhat. Compact heads. Leaves uncurled.
12 Salamander	60	13	12 Compact heads; leaves uncurled.
13 Black Seeded Tennis Ball	59	13	13 Compact heads; leaves uncurled.
14 Golden Gate	64	10	14 Compact heads; leaves uncurled.
15 Golden Queen	58	9	15 Not desirable for garden culture. A forcing heading variety with uncurled leaves.
16 May King	60	6	16 Not suitable for field culture. Leaves uncurled.
17 White Seeded Tennis Ball	....	2	17 Not suitable for field culture. Goes to seed almost as soon as headed.

In addition to the above varieties ,two promising sorts tested in 1907 are Holyrood Hot Weather and All Seasons, which look much alike. The leaves are almost smooth and the plants head well. The Holyrood Hot Weather, which is the most promising, stayed in condition twenty-nine days, and the All Seasons twenty-three days, compared with Hanson twenty-nine and Iceberg twenty-eight.

TOMATOES.

TEST OF VARIETIES.

The early part of the season of 1907 was not very favourable to tomatoes as the weather was cool, but later in the summer they did better and a fairly good crop of fruit ripened, especially of the early varieties. The seed for the uniform test plots was sown in a hot-bed on March 30, 1907. The plants were transplanted to strawberry boxes on April 23, and planted in the open 4 feet apart each way on June 6. There were 48 varieties planted in 1907, five plants of each being used in the test. As in previous years, the best strains of Sparks' Earliana continue to be the most satisfactory scarlet tomatoes for extra early as there are more smooth tomatoes among the earliest ripe fruit than other sorts. The Central Experimental Farm selection from the earliest fruit of the previous year was again the first to ripen its fruit, but the extreme earliness has been obtained at the price of vigour and productiveness, the total yield being small in 1907. The Chalk's Early Jewel, while not yielding quite so well as those in the table of twelve most productive, continues to be the best early and main crop scarlet variety combined, as it is nearly as early as Sparks' Earliana and is very smooth and regular.

The Earliest Pink and June Pink are two promising early, purplish-pink sorts. The soil in the tomato plantation, which was a light sandy loam, was kept well cultivated until the plants covered the ground. No training was given the plants in this test.

TOMATOES—TWELVE BEST YIELDING VARIETIES, 1907.

Name of Variety.	Date of First Ripe Fruit, 1907.	Yield of Ripe Fruit to Aug. 16, 1907, Five Plants.		Estimated Yield Per Acre, Ripe Fruit to Aug. 16, 1907.		Total Yield of Fruit Per Plant, 1907.		Total Yield of Ripe Fruit, All Pickings, 5 Plants, 1907.		Remarks.
		Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	
Nolt's Earliest..........	Aug. 15	..	8	272	4	24	0	120	0	Medium size, scarlet, flattened, semi-wrinkled.
Sparks Earliana (Johnson's improved strain).	" 12	3	..	1,633	8	23	6	117	0	Medium to below medium size, scarlet, fairly regular, smooth. A good strain.
Early King............	" 8	2	12	1,497	6	21	1	105	4	Medium size, scarlet, flattened, semi-wrinkled, regular. Promising if smoother.
Maule's Earliest of All ..	" 14	6	4	3,403	2	20	13	104	4	Medium to large, scarlet, flattened, semi-wrinkled to smooth or angular.
Florida Early...........	" 13	2	..	1,089	0	19	13	99	..	Large, scarlet, flattened, semi-wrinkled, irregular.
Turner's Hybrid..	" 14	1	8	816	12	19	8	97	8	Above medium size, purplish-pink to crimson, flattened, fairly smooth and regular.
June Pink..............	" 12	2	..	1,089	0	18	5	91	8	Medium to large, purplish-pink, roundish, fairly smooth.
Sparks Earliana (Robertson's selected)..... .	" 12	4	..	2,178	0	17	9	88	..	Medium size, scarlet, roundish, semi-wrinkled to smooth, irregular.
Sutton's Earliest of All..	" 14	2	..	1,089	0	17	0	85	..	Medium size, scarlet, somewhat flattened, semi-wrinkled, regular.
Sutton's A. I..........	" 6	1	8	816	12	15	9	78	..	Medium size, scarlet, round, smooth, slightly angular, regular, firm.
From Astrachan, Russia.	" 12	4	8	2,450	4	15	6	77	..	Large, scarlet, flattened, wrinkled, very irregular.
Dreer's Superb Salad....	" 7	2	3	1.191	2	14	7	72	3	Below medium size, scarlet, round, regular, smooth, firm.

TOMATOES—SIX EARLIEST VARIETIES, 1907.

Name of Variety.	Date of First Ripe Fruit, 1907.	Yield of Ripe Fruit to Aug. 16, 1907.		Estimated Yield per Acre, Ripe Fruit to Aug. 16, 1907.		Total Yield of Fruit per plant 1907.		Total Yield of Ripe Fruit, all pickings, five plants, 1907.		Remarks.
		Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.	
Earliest Pink..........	Aug. 12.	10	0	5,415	0	13	1	65	8	Medium to below medium size, purplish-pink, roundish to flattened, smooth.
Maule's Earliest........	" 14.	6	4	3,403	2	20	13	104	4	Medium to large, scarlet, flattened, semi-wrinkled to smooth or angular.
Dreer's Earliest of All...	" 9.	5	4	2,858	10	8	9	42	12	Medium size, wrinkled, flat, irregular.
From Astrachan, Russia.	" 12.	4	8	2,450	4	15	6	77	0	Large, scarlet, flattened, wrinkled, very irregular.
Atlantic Prize..........	" 15.	4	8	2,450	4	11	0	55	0	Medium size, scarlet, smooth to semi-wrinkled.
Spark's Earliana (C.E.F. selected, earliest).....	" 6	4	5	2,348	3	4	2	20	13	Medium size, scarlet, roundish, semi-wrinkled to smooth, irregular.
Spark's Earliana (Robertson's selected)......	" 12.	4	0	2,178	0	17	9	88	0	Medium size, scarlet, roundish, semi-wrinkled to smooth, irregular.

EXPERIMENTAL SHIPMENTS OF TOMATOES TO GLASGOW, SCOTLAND, 1907.

Owing to the low prices which are obtained for tomatoes by the Ontario vegetable growers who grow this vegetable in large quantities for the canning factories and for city markets, they are looking for other markets to dispose of their produce. Some tomatoes are being shipped to the Northwest with profitable returns, and it was thought that as there was cold storage on the steamers sailing from Montreal to Great Britain the tomatoes might be shipped there with profit also. Hence to get information on this subject it was planned to make several small shipments in 1907.

On January 21, 1907, a letter was sent to Mr. J. A. Findlay, Canadian Agent in Glasgow, Scotland, in which information was asked in regard to the prospects of sending tomatoes to Glasgow profitably. In a letter dated February 20, 1907, he wrote:—

'I am in receipt of yours of 21st ult. regarding trying experimental shipments of tomatoes during the approaching summer season to arrive from the middle to the end of August. I feel little or no profit would be gained on shipments reaching the Glasgow market at that period, as it is then the very height of the Scotch season, while the market is likewise handling heavy consignments from English, Guernsey (Channel Islands) and French growers. I have inquired the opinion of the leading fruit brokers and also of various large retail fruiterers in Glasgow, and all are unanimous in expressing their opinion against the venture being a profitable one, unless you can manage to get them forward to arrive about the middle of July or thereabout (or in the event of a partial failure in some of the producing centres).

'Regarding the size of tomatoes, just now tomatoes of about five and a half to six and a half inches in circumference, and averaging about eight or nine to the pound are the ruling size, and I doubt if a smaller species would find a ready market in August, as then the Scotch are plentiful and quite half as large again, and smooth-skinned varieties.

'The popular colour on the Glasgow market is a deep red. Tomatoes which are more or less wrinkled do not sell freely here especially at that season. The packages

most in vogue are square boxes containing about 12 to 15 pounds; one broker suggests 12 to 18 pounds, and in the event of the latter being adopted to have a division in the centre. The Canary Island shippers forward theirs in 12 pound boxes, four rows deep per box, and four boxes being strapped together down the ends, and as a box is required, the connecting straps are sawn asunder, thus leaving the remainder still intact.

'The market here is supplied from May to October with Scotch, English, Channel Islands and French, and from November to April by Canary Island tomatoes.

'For your guidance I give you the wholesale prices generally ruling in August for the various countries produce:—

'Scottish, 4d. to 5d. English, 3d. to 4d. Guernsey (Channel Islands), 2d. to 3d. French, 1½d. to 2d. per lb. I also obtained the following average retail prices from the largest firm of retail fruiterers (Messrs. Malcolm Campbell & Co.), who are also importers: May, 8d. per lb.; June, 6d. per lb.; July, 5d. per lb., and August, 3½d. per lb. for Scotch tomatoes. Perhaps these prices may be of service to you in guiding you as to the possibility of profit at the lowest returns of, say, French produce.

'(Signed) JAS. A. FINDLAY.'

Notwithstanding the unfavourable prospect, tomatoes were planted for the purpose of making some experimental shipments. The Frogmore Selected and Stirling Castle varieties proved to be satisfactory for the purpose as they are about the size and are firm and good for shipping on this account. The Honour Bright was also grown, but it is too late a tomato for the Ottawa district.

Mr. Robert Thompson, of St. Catharines, Ont., who has had considerable experience in shipping tomatoes to the Northwest kindly furnished information from the results of his experience.

On September 3, 12 boxes were shipped in cold storage along with some apples per str. *Cassandra,* Donaldson line, to Thomas Russell, Glasgow. The tomatoes were picked when they were beginning to turn red, some specimens having considerable red, wrapped in tissue paper and packed in two tiers in boxes 5 x 11 x 20 inches, or just half the size of the apple boxes. The tomatoes left Ottawa by freight on the evening of September 3, and reached the steamer in time to be loaded before she sailed on the morning of September 5.

On their arrival in Glasgow they were examined by Mr. Findlay, who wrote:—

'GLASGOW, September 18, 1907.

'Your experimental shipments of apples and tomatoes came to hand on Monday the 16th inst. The apples were discharged from the steamer's refrigerator chamber in good order and the cases were landed without damage, as were also the boxes of tomatoes. I found the latter were slightly soft generally and the papers covering the tomatoes damp, the fruits were not too attractive looking from a market point of view, as many were not evenly coloured, some being greenish yellow, spotted and hard where thus marked.

'I understand they brought about 4s. 6d. per case.

'I shall pay close attention to your various shipments.

'(Signed) JAS. A. FINDLAY.'

Mr. Thomas Russell, to whom the tomatoes were shipped, wrote:—

'In regard to the tomatoes. The price realized for these cannot be taken as a guide for heavy quantities, as we could not have sold say 100 cases at the same price as these 12 cases realized. The fruit looked fairly well, but on examination many of the tomatoes were found to be over-ripe, and some of them beginning to decay, and if they had been a few days longer in the steamer they would certainly have been classed as in bad condition. A percentage of the tomatoes which had been packed are what we designate here as 'Greensides,' that is showing green on one side of the

tomato, and several of the tomatoes were over-large. In Scotland here Scotch tomatoes are very carefully selected, and any tomato with a green side or slight blemish is kept out, and most growers classify their tomatoes as As, Bs and Cs, the As being all of a uniform size, free from blemish, and of good colour, while Bs are tomatoes which are a little smaller in size, and also of good colour and free from any blemish, and Cs are large-sized tomatoes, and those too small to pack under the B grade. At the present time Scotch tomatoes are quite plentiful on our market, and to-day, for example, we sold As for 4d. to 5d. per lb., Bs from 3d. to 4d., and Cs from 2d. to 3d. Looking at the shipment of tomatoes from Canada to Glasgow in a commercial aspect, we could not possibly recommend further consignments.

'(Signed) THOMAS RUSSELL.'

A second shipment of 14 boxes was shipped by SS. *Lakonia* on September 9, and on their arrival Mr. Findlay wrote:—

'GLASGOW, September 24, 1907.

'As regards the tomatoes, I carefully examined several boxes of them and as far as I could judge I thought them to be in better condition than last week, first the wrapping papers were dry compared with last, the fruit themselves seemed somewhat more uniformly larger and I thought rather more evenly coloured, but yet a good few in each box were soft and "going," one box I saw had quite room for another row and at either end of the box were several rows of soft tomatoes caused by the play against the ends of the box during course of handling.

'(Signed) JAS. A. FINDLAY.'

Mr. Russell wrote regarding this shipment as follows:-

'GLASGOW, September 28, 1907.

'In regard to the tomatoes, we beg to say that these were in a somewhat similar condition to the previous shipment, a good percentage of the fruit in each case being soft, and showing signs of decay. Home tomatoes were very plentiful when these arrived, and were selling at even lower prices than advised in our previous letter, and we could not obtain more than 2s. 6d. per case for these ex *Lakonia*.

A third shipment of 17 boxes was shipped per SS. *Parthenia* on September 16.

Mr. Findlay wrote of these as follows:—

'GLASGOW, October 2, 1907.

'The 17 boxes of tomatoes arrived per the above steamer, but I find no improvement in this parcel from the two previous shipments. Many of the tomatoes throughout the boxes still being soft, the larger specimens I think show more inclined to softness than the smaller ones. I called round on Mr. Thos. Russell's sale and watched him endeavour to execute a sale, but it appeared to be unsuccessful while I was there.'

'(Signed) JAS. A. FINDLAY.'

Mr. Russell wrote regarding the third shipment as follows:—

'GLASGOW, October 5, 1907.

'We beg to send you herewith account sales for your consignment of tomatoes ex steamer *Parthenia*, the total net proceeds of which, 4s. 2d., has been carried to your credit, and will be included in next remittance. We regret we cannot report any improvement in the landing condition of this consignment of tomatoes, and as you

can see, there is practically no demand for them here, our local supply being very plentiful and cheap.

'(Signed) THOMAS RUSSELL.'

A fourth shipment of 11 boxes of tomatoes was made per SS. *Athenia* on September 23.

Mr. Findlay wrote of the fourth shipment as follows:—

'The boxes of tomatoes on the other hand, I regret to say, show no improvement in their condition on arrival, each box showing a fairly high percentage of soft and "going" fruit, but perhaps what serves to their being looked upon unfavourably by buyers as much as anything is the lack of uniformity of colouring, some I examined being green, others yellowish red, this coupled with the state of the tomatoes as compared with the well coloured and sound condition of the home article is against a ready sale of the Canadian tomatoes.

'(Signed) JAS. A. FINDLAY.'

Mr. Russell said of the fourth shipment:—

'GLASGOW, October 10, 1907.

'The tomatoes in this case were in a similar condition to the previous lots, and from the price obtained you will see that there is really no demand for them on this market on account of circumstances explained in previous letters.

'(Signed) THOMAS RUSSELL.'

From the above letters it will be readily seen that even if the tomatoes had presented a more even appearance on arrival there would have been little chance of their bringing remunerative returns. Growers who are shipping tomatoes to Winnipeg have found by experience that the tomatoes are more uniform in appearance on arrival if picked in a somewhat riper condition than those shipped to Glasgow, but the fact that some of the tomatoes were over-ripe on arrival would indicate that if all had been picked as ripe as they were, which was when some green was still showing, the tomatoes would not have arrived in as good condition as they did.

RETURNS FROM TOMATOES AND APPLES SHIPPED TO GLASGOW.

Three small shipments of apples were made to Glasgow in 1907 at the same time as the tomatoes, and the following are accounts of sales of both:—

Account sales 38 C/s apples and tomatoes ex steamer *Cassandra*:

Mark.	Quantity.		£ s. d.	£ s. d.
No. 1	12	C/s tomatoes at 4s. 6d..	2 14 0	
	26	C/s Duchess at 8s. 6d..	11 1 0	
	—			13 15 0
	38			

	£ s. d.	£ s. d.
Charges—		
Freight on goods..	2 14 2	
River and harbour dues, master porterage, landing, selecting, coopering, catalogues, advertising, cartage to warehouse, receiving and delivering..	19 0	
Commission and guarantee..	13 9	
		4 6 11
Net proceeds..		9 8 1

GLASGOW, September 27, 1907.

Account sales of 58 boxes apples ex steamer *Lakonia*:

Mark.	Quantity.		£ s. d.	£ s. d
No. 1	14	C/s tomatoes at 2s. 6d..	1 15 0	
	18	C/s Duchess at 9s. 6d..	8 11 0	
	26	C/s Charlamoff at 9s. 6d..	12 7 0	
	—			22 13 0
	58			

Charges—

Freight on goods..	4 4 3	
River and harbour dues, master porterage, landing, selecting, coopering, catalogues, advertising, cartage to warehouse, receiving and delivering..	1 9 0	
Commission and guarantee..	1 2 8	
		6 15 11
Net proceeds..		15 17 1

GLASGOW, October 4, 1907.

Account sales of 17 boxes tomatoes ex steamer *Parthenia*:

Mark.	Quantity.	£ s. d.	£ s. d.
No. 1	9 boxes tomatoes at 2s. 6d..	1 2 6	
	2 boxes tomatoes at 2s. 3d..	4 6	
	6 boxes tomatoes at 2s..	12 0	
	—		1 19 0
	17 boxes.		

Charges—

Freight on goods..	1 4	
River and harbour dues, master porterage, landing, selecting, coopering, catalogues, advertising, cartage to warehouse, receiving and delivering..	8 6	
Commission and guarantee..	1 11	
		1 14 10
Net proceeds..		4 2

GLASGOW, October 10, 1907.

Account sales of 91 boxes apples and tomatoes ex steamer *Athenia*:

Mark.	Quantity.		£ s. d.	£ s. d.
No. 1	11	boxes tomatoes at 1s. 6d..	16 6	
	35	" Antonovka at 6s. 6d..	11 7 6	
	35	" Golden White at 7s. 6d.. ..	13 2 6	
	10	" Anis at 7s. 6d..	3 15 0	
	—			29 1 6
	91			

Charges—

Freight on goods..	7 0 10	
River and harbour dues, master porterage, landing, selecting, coopering, catalogues, advertising, cartage to warehouse, receiving and delivering..	2 5 6	
Commission and guarantee..	1 9 1	
		10 15 5
Net proceeds..		18 6 1

Writing of the apples sent during 1907, Mr. Thos. Russell, Glasgow, states in a letter dated October 10, 1907 :

'We really must congratulate you on the manner in which the consignments of apples you have sent us this season have been packed, and they have landed here in perfect condition, and have given entire satisfaction to the purchasers.'

POTATOES.

The potato crop is one of the most important crops in Canada, hence information in regard to potatoes should prove useful to a large number of people. For more than twenty years the Experimental Farm has been testing varieties of potatoes to determine which kinds were the best and gave the largest crops, and the information furnished each year in the annual report must have done much to encourage the planting of the best varieties.

The varieties of potatoes which in the past have been distributed to farmers have been for the most part those which have yielded best in the experimental plots.

The season of 1907 was not a very good one for potatoes as the early part of the summer was comparatively dry and the tubers did not form well. The seed which was planted was not as good as usual as the potatoes of the previous year were small and prematurely ripened. The uniform test plots were planted on May 28. The soil was a good sandy loam which had been manured for vegetables in 1906. It was well prepared by ploughing and harrowing with the disc and smoothing harrow. The sets, which had at least three good eyes, were dropped one foot apart in drills 30 inches apart, made with the double mould board plough. Sixty-six sets of each kind were planted. They were covered with the hoe. Before the potatoes appeared above ground the land was harrowed to destroy weeds. The potatoes were cultivated until there was danger of injuring the vines too much. The vines were kept well sprayed with Bordeaux mixture and Paris green. There was almost no potato rot in 1907. The potatoes were dug on October 15.

In the table only the 30 most productive varieties out of 124 grown in the uniform test plots are given; these are nearly all medium or main crop varieties. Preceding these is a table of the varieties which have averaged the most productive during the past five years.

TWELVE MOST PRODUCTIVE VARIETIES OF POTATOES : AVERAGE OF FIVE YEARS, 1903-07.

Number.	Name of Variety.	Number of Years under Test.	Season.	Colour.	Quality.	Average Yield per Acre, 1903–1907.	
						Bush.	Lbs.
1	Rural Blush	19	Late	Pink and reddish	Good	324	10
2	Carman No. 1	13	Medium late	White	"	314	10
3	Dooley	7	Medium	"	"	308	53
4	Dreer's Standard	14	Late	White	"	299	38
5	Canadian Beauty	10	Medium	Pink and white	"	294	48
*6	Burnaby Mammoth	15	"	"	"	283	22
7	Late Puritan	14	Late	White	"	280	17
8	Holborn Abundance	19	"	"	"	279	50
9	Sabean's Elephant	13	"	"	"	274	34
10	Crine's Lightning	6	Early	Pink with red eye.	"	267	58
11	Everett	17	"	Pink	"	263	7
12	Rochester Rose	13	"	"	"	262	41

* This variety was first grown under the name of Burnaby Seedling, and then procured under the name of Burnaby Mammoth. The average yield given is from the new strain for four years, and the old for one year.

Potatoes—Test of Varieties.

Thirty Most Productive Varieties in Uniform Plots, 1907.

Number.	Name of Variety.	Quality.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.		Colour.
			Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
1	Pinnacle Beauty	Medium	462	..	426	48	35	12	Pink or reddish.
2	King Edward (Wilson)	Good...	448	48	400	24	48	24	White.
3	Dalmeny Beauty	" ...	327	48	290	24	37	24	"
4	Sutton's Prolific	" ..	321	12	294	48	26	24	"
5	Barkley's Seedling	" ...	294	48	246	24	48	24	Pink.
6	New Reliance	" ...	277	12	220	..	57	12	"
7	Nebraska	" ...	261	48	237	36	24	12	White.
8	Hard to Beat	" ...	237	36	206	48	30	48	"
9	Sharpe's Victor	" ...	235	24	169	24	66	..	"
10	The Factor	" ...	233	12	204	36	28	36	"
11	Hick's Jubilee	" ...	222	12	167	12	55	..	"
12	Million Dollar	....	217	48	165	.	52	48	"
13	Naught Six	....	217	48	156	12	61	36	Pink or reddish.
14	Dooley	Good...	217	48	193	36	24	12	White.
15	Norcross	" ...	206	48	132	..	74	48	"
16	Dewey	Medium	204	36	180	24	24	12	"
17	Pearl of Savoy (O. A. C.)	" ..	198	..	103	24	94	36	"
18	Early Bird	....	198	..	132	..	66	..	"
19	Woodbury's White Rose	....	193	36	129	48	63	48	"
20	20th Century	....	191	24	160	36	30	48	"
21	Carman No. 1 (C. E. F.)	Good...	184	48	149	36	35	12	"
22	Star of the East	" ..	184	48	116	36	68	12	Pale pink.
23	Immigrant	" ...	178	12	116	36	61	36	
24	State of Maine	" ...	173	48	156	12	17	36	White.
25	Magyar King	....	169	24	99	..	70	24	"
26	Vermont Gold Coin	Good...	169	24	136	24	33	..	"
27	Holborn Abundance	Medium	169	24	143	..	26	24	"
28	Standard	......	167	12	116	36	50	36	"
29	From L. A. Sovereign	....	167	12	92	24	74	48	Pale pink.
30	Wee McGregor	Good...	162	48	88	..	74	48	White.

SMALLER PLOTS OF POTATOES.

A larger number than usual of small plots of potatoes was planted in 1907. A greater interest in the potato crop has been noticeable during recent years and many varieties are sent in to be tested at the Experimental Farm in addition to those which are bought for experimental purposes. In 1907 there were 83 varieties grown in smaller plots than those used for the uniform test, the number of sets planted varying from thirty-three to two.

In the following tables will be found twenty of the most productive varieties, put into two tables for greater fairness in comparison; those from the larger plots in one table, and those from the smaller plots in the other.

POTATOES: YIELDS FROM SMALLER PLOTS.

TEN MOST PRODUCTIVE VARIETIES—33 AND 16 SETS PLANTED.

Number.	Name of Variety.	Number of Sets Planted.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.	
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	White Giant, from G. M. Cunningham, Collingwood, Ont.	33	391	36	330	..	61	36
2	Dibble's Favourite, from J. S. Honey, Warkworth, Ont.	33	391	36	352	..	39	36
3	Unknown, from Newton Anderson, Damascus, Ont.	16	353	55	308	33	45	22
4	Shipper's Pride, from J. S. Honey, Warkworth, Ont.	33	303	36	246	24	57	12
5	From T. Rowan, McGregor, Man	33	264	..	215	36	48	24
6	Unknown, from F. E. Anger, St. Boniface, Man.	33	250	48	220	..	30	48
7	White Beauty, from L. Wagner, Branch La Have, N. S.	16	245	1	217	48	27	13
8	Sirdar	16	245	1	154	16	90	45
9	Johnson's No. 2	16	226	52	154	16	72	36
10	Prince Albert	33	224	24	202	24	22	..

POTATOES: YIELDS FROM SMALLER PLOTS.

TEN MOST PRODUCTIVE VARIETIES—8 AND 4 SETS PLANTED.

Number.	Name of Variety.	Number of Sets Planted.	Total Yield per Acre.		Yield per Acre, Marketable.		Yield per Acre, Unmarketable.	
			Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	The Cottar	4	471	54	..	..	..	..
2	Wellington, from W. J. Kerr, Ottawa, Ont.	8	435	36	381	9	54	27
3	Big Rose, " "	8	399	18	363	..	36	18
4	Highlander, from H. J. Presley, Port Huron, Mich., U.S.	4	363	..	..	..	..	..
5	President Kruger, from H. J. Presley, Port Huron, Mich., U.S.	4	363	..	.	..	..	.
6	Governor La Follette, from Rev. J. R. Lawrence, Raynham, Mass.	4	363	..	217	48	145	12
7	Ireland, from Rev. J. R. Lawrence, Raynham, Mas.	4	326	42	290	24	36	18
8	Richmond, " "	8	290	24	254	6	36	18
9	King Edward VII, from W. J. Presley, Port Huron, Mich.	4	290	24	290	24	..	..
10	Noxall from W. J. Kerr, Ottawa, Ont.	8	290	24	254	6	36	18

POTATOES—TEST OF RESISTANCE TO BLIGHT AND ROT.

In the Annual Report for 1906 the results were published of a test in selecting certain varieties of potatoes for resistance to blight and rot. It was shown that the average yield per acre of seven varieties, the seed of which had been selected from the best hills of the year previous, was 28 bushels 55 lbs. per acre more than from unselected seed. This test was continued in 1907, the number of varieties used being 36; some of those planted in 1906 being discarded and new ones tried. These had been found among the freest from blight in previous years. Thirty-three sets of each

variety or selection were planted on May 30. The potatoes received thorough cultivation and were sprayed with Paris green and water to destroy the Colorado potato beetle, but no Bordeaux mixture was used. The potatoes were dug on October 17, and while the total yield of each plot was recorded the marketable tubers from the ten most productive hills of each variety or selection were kept separate for planting in 1908.

Following is a table giving the yields obtained from six of the seven varieties reported on in 1906. It will be seen that there is an average difference in favour of the 1905 selection of 8 bushels 4 lbs. per acre, but the total yield per acre of the 1906 selection is less than the unselected, although the yield of marketable potatoes (which is not recorded in this report) is a little greater. The results in 1907 might have been more favourable to the selections if the seed used had been better. The season of 1906 was one of the poorest years for potatoes we have experienced. Owing to the dry weather they ripened prematurely and were small as well. The growth from this poor seed was not as regular and strong in 1907 as it might have been, hence the apparent anomalies in some varieties. From the marked results obtained in 1906 in favour of selected seed it would appear that even if only for temporary improvement it is worth while adopting a system of selection for potatoes.

Potatoes—Test of Resistance to Blight, 1907.

Yields of Six Varieties Tested for Two Years.

Name of Variety.	Unselected Total Yield per Acre.		Selected in 1905 and not in 1906. Total Yield per Acre.		Selected in 1906 from Selection of 1905. Total Yield per Acre.	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Clay Rose	140	48	145	12	110	–
Rural Blush	114	24	184	48	167	12
Vermont Gold Coin	101	12	66	–	88	–
Morgan Seedling	114	24	79	12	52	48
Carman No. 1	96	48	123	12	131	–
State of Maine	52	48	70	24	52	48
Average	103	24	111	28	100	18

As has been stated, there were 36 varieties of potatoes tested in 1907 for resistance to blight. The following six are those which yielded the best:—

Six Most Productive Varieties of Potatoes not Sprayed with Bordeaux Mixture.

Name of Variety.	Total Yield per Acre.		Yield per Acre Marketable.		Yield per Acre Unmarketable	
	Bush.	lbs.	Bush.	lbs.	Bush.	lbs.
Pearmain from T. Rowan, McGregor, Man. (New seed)	334	24	281	36	52	48
The Factor (unselected)	233	12	193	36	39	36
King Edward (unselected)	215	36	162	48	52	48
Dalmeny Beauty (selected, 1906)	193	36	171	36	22	–
Dr. Maerker (selected, 1905)	193	36	154	–	39	36
Rural Blush (selected, 1905)	184	48	136	24	48	24

SPRAYING TO CONTROL FUNGOUS DISEASES.

During the past season diseases have not been so injurious to fruits in Ontario and Quebec as usual and it is probable that some fruit growers will on this account neglect to spray their trees until they are again convinced by the prevalence of disease that something must be done to control it. The good effects of spraying have been demonstrated so often that all intelligent fruit growers should now know the benefits of it. If spraying is neglected the fungous diseases will, as soon as conditions are favourable, spread rapidly again. The nearer the different diseases are eradicated in seasons when they are the least troublesome the less injurious they are likely to be when conditions favour their rapid spread, hence spraying should be done every year, and done thoroughly.

Dry Rot of the Apple.—While most diseases were less injurious than usual in 1907 there is an injury to apples which was very pronounced in certain sections. Attention to it was drawn in Northumberland and Hastings counties. This is the 'dry rot' of apples. This disease or physiological injury was treated of in the report of the Horticulturist for 1899, where the injury is described and information given in regard to it. The dry rot is manifested on the exterior of the fruit by small circular depressions on the surface or skin of the apple. These depressions are $\frac{1}{8}$ to $\frac{1}{4}$ of an inch deep and $\frac{1}{4}$ to $\frac{3}{8}$ of an inch in diameter. On removing the skin of the apple each depression will be found to be the centre of a small area of dryish brown tissue. In some varieties badly attacked this brown and pithy tissue extends in a more or less complete network over the whole surface of the apple. The texture of the injured parts is dry and tough. The flesh of the apple is rarely affected to a depth of more than $\frac{3}{8}$ or $\frac{1}{2}$ of an inch, although sometimes it is found all through the flesh. The affected flesh is dry and flavourless, but not bitter. While affected apples are not rendered wholly unfit for use their appearance and salability are destroyed.

The most satisfactory explanation of the disease or injury is given by Wortmann and Bschokke, two German investigators. Briefly, it is that the dry spots are caused by the acids of concentrated sap which has become concentrated by the transpiration of moisture from the surface of the fruit faster than sap can be taken up from the underlying tissues. As some varieties are able to conduct the moisture faster than others they are not so much affected. It was found that the varieties subject to spot conducted water slower from one layer to another than those not affected. No remedy has been discovered for this disease but good culture is recommended in order to hasten the flow of sap, especially in a dry time when there is rapid transpiration from the outer layers of flesh.

From correspondence in 1899 the following additional information was gathered:—

1. The Dry Rot, 'Brown Spot,' or 'Baldwin Spot' affects at least 60 varieties of apples, and is thus not confined to only a few sorts. The Baldwin appears to be worse affected, but this may be due to the fact that it is grown more extensively than any other variety in those parts where the rot is most prevalent.

2. Its range extends from the Atlantic to the Pacific; it appears, however, from data received, not to be found in Prince Edward Island, New Brunswick, and the Southern and Southwestern States, although it may be there also.

3. It appears to be most prevalent in Eastern Ontario, Quebec, British Columbia and the Eastern States.

4. Opinions of growers differ very much as to the cause of the rot.

5. The results of the investigations of Jones, Wortmann and Bschokke seem to throw most light on the cause of the rot.

6. No good remedy has yet been found for Dry Rot.

FOREST BELTS.

The work in the forest belts throughout the year consisted mainly in taking the annual measurements of average trees, removing dead trees and branches, mowing the grass in open places, destroying injurious insects, and in some places in the mixed belt cutting back strong growing but less valuable trees in order that the leaders of the more valuable kinds might not be destroyed. The mixed belts, while very interesting as showing the relative ability or inability of the different species to endure shade, could with the greater knowledge gained after twenty years' experience be planted now with less loss of good but slower growing kinds. In the mixed belt, for instance, the American elm, box elder, and to some extent the green ash have grown so rapidly and formed such a canopy overhead that almost everything else is being killed, or promises to be killed in a short time. One lesson which has been learned is that certain few species would do well together in a mixed belt, and that several good combinations could be made of a few species in each to better advantage than a larger number of species mixed together.

ARBORETUM AND BOTANIC GARDEN.

There was but an average amount of winter killing in the Arboretum and Botanic Garden in 1906-7, although the winter was a very severe one. Since the Arboretum was established there have been several severe or test winters which have thinned out most of the trees and shrubs which will not succeed at Ottawa, and as the additions each year are now not nearly so great as they were, the number of deaths is comparatively small. So many hardy species and varieties have grown into fine specimens that the individuals which kill to the ground, or kill back partly, each year are now not nearly so noticeable as they once were, the hardy ones being so much more prominent. The season of 1907, while not favourable to strong growth owing to the comparative dryness of the growing season, was not unfavourable to healthy development. and the trees and shrubs on the whole looked well. The usual notes were taken on the hardiness and growth of the specimens and the labelling carefully looked after.

The herbaceous perennial border, in which is now a very fine collection of plants, looked well in 1907. For some years notes have been taken on the hardiness and vigour of the plants, their height, length of blooming season, colour of the flowers and relative merit from an ornamental standpoint. In 1907 more time than usual was devoted to this work in order to make the records as complete as possible.

There were 118 species and varieties of trees and shrubs planted in 1907, and in the autumn of that year there was a total of 3,072 species and varieties alive in the Arboretum, or 4,652 specimens in all. Of herbaceous perennials 279 species and varieties were planted in 1907, making a total of 2,037 alive in the autumn. The additions were not in all cases kinds which had not been tested before, some being species which had previously died but had not yet been given a thorough test. In the Annual Report for 1906 the total number of specimens of trees and shrubs in the Arboretum and Botanic Garden should have read 4,701, the figures given being a misprint.

REPORT OF THE CHEMIST.

FRANK T. SHUTT, M.A., F.I.C., F.C.S., F.R.S.C.

OTTAWA, April 1, 1908.

DR. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith the twenty-first annual report of the Chemical Division of the Experimental Farms.

A considerable part of the work of the Division during the past year has already been published in bulletin form. I refer more particularly to our investigation in connection with the quality of wheat, carried on in conjunction with the Cerealist. Though the problem in hand—the relationship of composition to the breadmaking value—is as yet by no means solved, our results have given additional information respecting several of the factors generally recognized as determining 'strength' in a wheat or flour.*

The results of our investigatory work in connection with 'alkali' soils have also been issued as Bulletin No. 4, Experimental Farm Series II., entitled 'Alkali Soils, their Nature and Reclamation.' This should prove of practical value to those residing in districts in Northwestern Canada, where alkali lands occur.

Our work that brings us into direct communication with the individual farmer—correspondence and samples of an agricultural nature forwarded for examination—continues to increase. This is as might be expected, for with increased knowledge of the nature of their work, resulting from the reading of bulletins, agricultural papers, &c., there comes a better realization of the help that chemistry can give in the successful raising of crops and the feeding of animals.

In the following table we present a classification as to the nature of the samples received for analysis and the provinces from which they were sent.

SAMPLES Received for Examination and Report for the twelve months ended March 31, 1908.

Sample.	British Columbia.	Alberta.	Saskatchewan.	Manitoba.	Ontario.	Quebec.	New Brunswick.	Nova Scotia.	Prince Edward Island.	Total.	Number still awaiting examination.
Soils	16	10	35	8	10	13	3	2	7	139	35
Mucks, muds and marls	3	......	1	1	......	1	2	2	1	16	5
Manure and fertilizers	4	2	1	.....	3	7	5	6	......	34	6
Forage plants and fodders	3	5	9	5	40	17	4	6	1	94	4
Well waters	5	16	11	8	47	29	3	6	1	126	......
Miscellaneous, including dairy products, fungicides and insecticides	5	4	25	27	234	56	1	6	......	361	3
Totals	36	37	82	49	334	123	18	28	10	770	53

* Bulletins Nos. 57 and 60, Experimental Farm Series.

In this connection we wish to advise our readers that it does not come within our province to analyse and report upon samples of commercial fertilizers as manufactured or sold in Canada. Correspondents desiring such analyses should communicate with the Inland Revenue Department, Ottawa. Nor can we undertake mineral examinations or make assays; our work is strictly agricultural. Questions relating to minerals may be sent to the Geological Survey Department, Ottawa. And lastly, we cannot make any analysis in suspected poisoning cases of animals.

Very brief mention may be made of the more important chapters of the present report, as follows:—

WHEAT.

The influence of environmental conditions on the composition of the grain is discussed, the data used as the basis of the argument being obtained from a series of experiments in growing wheat on newly cleared and summer-fallowed land in the Northwest. The freshly broken soil produced the softer (more starchy) grain, due, we conclude, to a long vegetative growth of the wheat plant consequent upon the larger moisture-content which characterized this soil throughout the whole growing season.

A special inquiry has been made into the nature of the grain and flour of frosted wheat. It has been shown that the nitrogen-content of such wheat is somewhat higher than that of normally ripened grain. The proportion of nitrogen in the albuminoid (protein) form is, however, somewhat less than in mature wheat.

The flour from frosted wheat has also been studied, with the result that such has been found to contain as high a proportion of albuminoid nitrogen as flour from sound, fully ripened wheat. From this we conclude that the non-albuminoid compounds are more particularly in those parts eliminated in the milling, viz., the embryo and the bran coats.

POTATOES.

Twelve well known varieties of potatoes have been analysed to ascertain what relationship, if any, existed between composition and table quality. The changes that take place during storage have also been studied. Our investigation has shown that there is very little difference between the varieties examined in point of composition, that the chemical data throw very little light upon the question of quality, and that during storage there is a loss in weight due to the drying out of the tubers.

ROOTS.

The percentages of dry matter and of sugar in the various roots as grown on the Central Farm, Ottawa, 1907, are given in tabular form.

The influence of inherited qualities as illustrated by two varieties of mangels have again been studied. The results are in accord with those of previous years, furnishing distinct and satisfactory evidence of the importance of the 'breed' factor.

We have again analysed samples from the three leading varieties of factory sugar beets as grown at the Experimental Farms in the Dominion. The results for 1907 are most gratifying, indicating a rich and pure beet at nearly all the locations from which samples were received.

FODDERS AND FEEDING STUFFS.

As far as was practicable analyses have been made of the more important feeding stuffs upon the market. The results are given in tabular form, and notes respecting the relative feeding value of the various milling by-products, &c., accompany the data. This chapter should prove useful to the dairyman and the farmer who are in the habit of purchasing concentrated feeding stuffs to supplement the home-grown fodders.

FERTILIZING MATERIALS.

Under this caption we report on analyses made during 1907 on dog-fish scrap, grape refuse from wine factory, waste from cotton factory, flue deposit and dust from elevators, and certain naturally occurring materials having a fertilizing value.

INSECTICIDES AND FUNGICIDES.

Examination has been made of the principal brands of formaldehyde on the market, with satisfactory results as regards strength and purity.

The effect of exposure on solutions of formaldehyde has been studied. Though loss of formaldehyde ensues there is an increase of strength on exposure, owing to the greater evaporation of the water or methyl alcohol in which the formaldehyde is dissolved.

A further series of experiments was undertaken to ascertain the effect of certain smut preventives on the vitality of wheat. This work was rendered desirable by reason of the large quantities of frozen wheat that would be used as seed in the spring of 1908, such wheat having a somewhat impaired vitality. It was found that frosted wheat was decidedly more susceptible to the action of solutions of formaldehyde and bluestone than normally ripened grain.

The lime-sulphur washes have been investigated from the chemical standpoint and information of a practical character respecting their preparation is furnished.

The nature of V 1. and V 2. fluids of Cooper and Nephews (England) has been examined into and reported upon. The value of the carbolic sprays in general for insecticidal purposes is as yet somewhat doubtful, and we therefore think that further evidence of a satisfactory character regarding these proprietary spraying fluids is most desirable.

MISCELLANEOUS.

Since February, 1907, we have determined the nitrogen compounds in each fall of snow or rain occurring at Ottawa. These are the first Canadian data on this subject, and they show, among other interesting matters, that the total nitrogen thus furnished per acre per annum (March, 1907-February, 1908) was 4·323 pounds, of which approximately 75 per cent was in the rain and 25 per cent in the snow.

Certain results of an interesting nature were obtained illustrative of the purification of both peaty and saline water by freezing.

Analyses are given of samples of salt and asphaltum from deposits of these materials above Lake Athabaska, Peace river district.

The work of the examination of well waters from farm homesteads has been continued. Our correspondence gives evidence that there is an ever increasing interest in the matter of a pure water supply for the rural home. It is extremely gratifying to note the progress that is being made in many districts in the installation of a water service for house and farm buildings and of the septic tank system for the disposal of sewage. It is by such means that life in the country is made more enjoyable, more wholesome and less laborious.

ACKNOWLEDGMENTS.

Mr. A. T. Charron, M.A., First Assistant, has continued to do good and efficient work, in the laboratory, in lecturing on agricultural subjects in French, and in assisting with the correspondence and the preparation of material for publication. My thanks are due to him for much very valuable assistance cheerfully rendered.

Mr. H. W. Charlton, B.A. Sc., who has also been on the staff for a number of years, has charge more especially of the nitrogen determinations and water analyses. From his long experience in these branches as well as in general analytical work, his labours have proved of considerable value in the conduct of the work of the Division.

It became necessary, owing to the increasing amount of chemical work of the Farms, to obtain further assistance. Accordingly, Mr. A. Gordon Spencer, M.Sc., was appointed to the staff in June, 1907. It affords me great pleasure to record my high appreciation of his services. He has shown himself a skilled analyst, with a marked aptitude and ability for research work, and I feel assured that his appointment will be of great value in coping with the many and varied investigations that form the chief part of our chemical work.

In a readjustment of the chemical staff I lost the services of Mr. J. F. Watson, who for many years gave me most efficient help in connection with the correspondence and general office work. Mr. Watson well earned my thanks for the careful and thorough manner in which he discharged his duties while connected with this Division.

He is succeeded by Miss Olive Robertson, who has in a very satisfactory way carried on the secretarial work of the Division, and to whom I am pleased to tender my thanks for duties performed in a careful and painstaking manner.

I have the honour to be, sir,
Your obedient servant,

FRANK T. SHUTT,
Chemist of the Dominion Experimental Farms.

WHEAT.

THE COMPOSITION OF THE GRAIN AS INFLUENCED BY ENVIRONMENT.

Though the composition of the crop from any particular variety of wheat is determined largely by that of the parent seed,—in other words, though heredity is a potent and, possibly in some cases, a dominating factor in influencing the character of the seed, environment has also a most marked effect on the grain. The term environment is used here in its widest sense, and includes the influences exerted by (1) climatic conditions, moisture, temperature, &c., during the growth and ripening of the wheat; (2) the nature of the soil—physical and chemical—and (3) the culture which the crop has received—time and method of seeding, &c.

The problem of the influence of environment on the composition of wheat, both as to nitrogen and ash content, has been investigated by many workers in England, on the continent of Europe and in the United States, and from the data that have thus accumulated we may safely draw the conclusion that of the various environmental influences named those of climate stand first and paramount in their effect on the composition of the grain. This is more particularly true as regards the percentage of nitrogen—the element which controls the proportion of gluten, and consequently in a large measure the quality of the wheat. It seems more than probable that the richness of the soil in nitrogen, save under abnormal conditions, has in itself but little determinative effect on the percentage of nitrogen of the wheat, for we find many sandy loams of the Northwest of moderate nitrogen-content producing wheat of equal gluten-content with that from heavy loams excessively rich in nitrogen. It was shown by the classic researches of Lawes and Gilbert of Rothamsted many years ago that manuring with various fertilizers had little influence on the composition of wheat, but that season (i.e., climatic conditions) was to be regarded as the principal factor affecting the character of the grain. Evidence more or less confirmatory of these views has been obtained in America from the investigations of Richardson, Wiley, Carleton, Thatcher, Snyder and others, so that while there may be a lack of agreement as to how far heredity influences the character of the progeny there is but little doubt of the more important part played by climatic conditions as compared with soil fertility in causing variation in the grain.

Climatic conditions (which of course include drought, excessive moisture and extremes of temperature) may and do affect (shorten or lengthen) the period of growth or, as perhaps more correctly put by Thatcher, the time which elapses from the formation of the kernel until it is ripe. It would appear to be this period or time that, apart from the influence of heredity, practically controls the nitrogen (gluten) content of the wheat—the shorter the period the higher the percentage of nitrogen. High temperatures and the absence of excessive moisture during the ripening period undoubtedly tend to hasten maturation of the grain and thus increase its percentage of protein.

Soft wheat on newly cleared scrub land.—It has been a matter of common observation that wheat grown on newly cleared scrub land in certain districts of the Northwest is more or less 'soft' or starchy in character. The seed sown may be No. 1 Hard or No. 1 Northern—hard, semi-translucent and glutinous—and the product is found as a rule to be possessed of whitish, opaque spots—piebald wheat—indicating clearly a deterioration in quality from a commercial point of view. With cultivation of the soil this tendency to produce soft, starchy wheat apparently disappears, the character of the wheat generally improving, so that after a number of years the

quality of the wheat grown may be greatly superior as measured by protein-content to that which is at first produced. Though the change is usually gradual and in the same direction, it has been noticed that the quality of the wheat on such land is markedly influenced by the character of the season, so that while in some years there may be but little difference between the crops from the older and the newer land (seed of the same description being sown on both), in other years the difference may be so great that their common parentage is not at all apparent.

This change from a hard, semi-translucent kernel to one that is soft or piebald is a change, as already indicated, not only in external and physical characters but in chemical composition; it is a falling off in commercial value marked by a decrease in the protein (gluten) content. Its extent can, therefore, be accurately traced by chemical means, by the determination of the protein in the wheat.

What may be the cause or causes of this softening of the wheat under the conditions described? To answer this inquiry the investigation about to be detailed was instituted in 1905, the field work being undertaken and carried out by Mr. John Mooney, of Valley River, Man., to whom my thanks are due for much valued co-operation.

The general plan of the experiment has been to select two areas on the same piece of land, one area being but recently cleared and 'broken,' the other having been under cultivation for some time. These areas have been sown on the same day, with seed of the same character, that is out of the same bag. Samples of the soil collected from both areas at frequent intervals throughout the growing season have been examined as to their water-content and the results charted. The percentages of plant food present, both in the form of 'total' and 'available' have also been determined in the resulting composite samples.

Samples of the threshed grain from each area, as also of the parent seed, have been submitted to analysis.

Series I., Season 1905.—The field work was not begun until 1906, but at the close of the season of 1905, Mr. Mooney furnished me with samples of wheat as grown that year on 'summer-fallow' and 'breaking,' respectively, together with one of the parent seed (Red Fife). These wheats differ considerably in appearance; that sown is a fairly good sample, though probably not equal to No. 1 Hard; the product of this on 'summer-fallow' is an excellent sample, hard and somewhat superior in appearance to the parent seed; and lastly that produced on the 'breaking' is decidedly soft with many opaque, starchy kernels. The analysis of these wheats furnished the following results:—

Series I., 1905:—

	Protein* (N x 5·7.) per cent
A—Wheat used as seed	11·11
B—Product of 'A' on 'breaking'	9·93
C—Product of 'A' on 'summer-fallow'	12·62

These results clearly show the falling off in protein (gluten) content in the wheat grown on 'breaking,' confirming the opinion gained from the examination already recorded. It is also of interest to note the increase in protein content of 'C' over that in the parent seed, indicating as it does that improvement, as well as deterioration, may follow a change of environment.

Series II., Season 1906.—Two wheats were used for seed: one, that already designated as 'B' and produced from 'breaking' the previous year; the other (now designated as 'F'), an exceedingly good sample grown at Hartney, Man., in 1905. Each

* To admit of strict comparison, the results throughout have been calculated on the basis of ten per cent water in the wheat.

of these was sown on 'breaking' and 'summer-fallow.' The date of sowing was May 1, that of cutting August 24.

The 'breaking' had been made in the June previous, the land being then cleared and deeply ploughed. This was followed throughout the remainder of the season (1905) by frequent and thorough surface cultivation to induce decay of the vegetable fibre and prepare a favourable seed bed for the following spring. This treatment would have the effect of increasing the soil's water-holding capacity. The soil would be classified as a rich sandy loam.

The 'summer-fallow' soil adjoining the above, had borne seven successive crops of grain (1898 to 1904) and had been fallowed the season previous to the experiment (1905). Since the object in this part of Manitoba is to destroy weeds rather than to conserve moisture, the working of the soil during the summer is neither deep nor frequent. Under such a system of fallowing it seems quite probable that the soil might not contain more water than that of an adjoining field that had borne a grain crop. Like the 'breaking,' this soil has all the characteristics of rich sandy loam. Both areas used in this experiment, I am assured by Mr. Mooney, are as nearly as possible similarly situated as regards aspect, slope, &c., and there is no reason to suppose that their 'water tables' differ materially. Nine years ago they formed part and parcel of the same area, covered uniformly, or apparently so, with small trees, shrubs and herbage. We have no chemical data respecting the soil of the 'summer fallow' field at the time of its breaking, which is unfortunate, nevertheless I think we can assume from the evidence that its composition and nature at that time must have been very similar to those of the 'breaking' as here recorded.

The moisture-content of the soil of these two fields throughout the season, as determined on samples collected to a depth of eight inches, may now be tabulated. The data are significant.

WATER in 'Breaking' and 'Summer-Fallow' soils at Valley River, Man., 1906.

—	May 5.	May 15.	May 29.	June 22.	July 13.	Aug. 2.	Aug. 24.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Breaking..	32·96	36·49	33·45	30·49	35·23	30·37	32·84
Summer-fallow	22·45	23·39	23·39	21·70	21 24	13·24	18·28

A truly remarkable difference in the moisture content in these two soils is to be noticed throughout the growing season. The 'breaking' was always found the moister soil, its percentages of water ranging from 9 to 14 higher than those of the 'summer fallow.'

A composite sample of the soil of each plot was made by thoroughly mixing the seven collections. The air-dried and prepared samples were submitted to analysis and the following results obtained :

ANALYSES of (air-dried) Soils.

	Breaking.	Summer fallow.
	p. c.	p. c.
Moisture	2·98	2·06
Organic and volatile matter	20·90	12·84
Insoluble residue (clay, sand, &c.)	51·74	65·07
Oxide of iron and alumina	5 50	10·52
Lime	10 25	3·47
Magnesia	2·44	1·63
Potash	0·14	0·19
Phosphoric acid	0·15	0·13
Soluble silica	0·02	0·02
Carbonic acid, &c. (undetermined)	5·88	4·07
	100·00	100·00
Nitrogen in organic matter	0·642	0·371
Available constituents—		
Phosphoric acid	0·0067	0·0067
Potash	0·0166	0·0069
Lime	1·306	0·93

The characteristic feature of these soils is their richness in vegetable matter and high nitrogen-content, and a point in this respct, to which attention must be directed, is the much larger percentages of these constituents in the 'breaking' than in the 'summer-fallow' soil. This higher humus-content naturally gives the 'breaking' soil a greater absorptive and retentive power for water and, taken in conjunction with the thorough cultivation this soil received the previous season, readily accounts, the writer thinks, for the 'breaking' being the moister soil.

Little need be said here, perhaps, regarding the remainder of the analytical data. Both soils are apparently well supplied with the mineral elements of plant food, that which is latent or in reserve as well as that more or less immediately available, though the percentages of phosphoric acid and potash are not quite equal to those in the stronger, i.e. more clayey soils, of the Northwest. Especial remark may, however, be made of the goodly proportion of lime, more particularly in the 'breaking' soil, an excellent indication of their fertility when taken in conjunction with the rest of the data. If we assume that originally the whole area was covered with soil of a like nature we have in these results an excellent illustration of the 'working down' of lime under cultivation.

The wheats as grown on these soils may now receive our attention. Their composition is given in the following table:—

Series 2, 1906—

	Protein (N x 5·7) per cent
Wheat used as seed (B)	9·93
'D' product of 'B' on 'breaking'	10·01
'E' product of 'B' on 'summer-fallow'	13·52

Wheats 'B' and 'D' would be termed soft or piebald. They are very much alike in appearance, though a careful examination shows that 'B' possesses a somewhat larger proportion of opaque, starchy kernels than 'D.'

Wheat 'E' shows no starchy grains. Though not very plump, all the kernels are hard and translucent, typical of the highest grades. The difference between 'B' and 'D' in protein-content is insignificant; indeed, the data are practically within the limit of experimental error. But between these wheats and 'E' as grown on 'summer

fallow' the difference is very great: it amounts to 3·5 per cent of protein. This tremendous improvement must have been brought about by a difference in environment, and our explanation, a tentative one, is as follows:—

The larger amount of moisture in the 'breaking' soil throughout the growing season prolonged the vegetative processes of the wheat plant, delaying or retarding the maturing of the grain. Possibly this effect is more marked in rich soils, such as those we are considering and which under such favourable conditions of moisture and temperature must constantly furnish available plant food, especially nitrogen, in abundance, than on soils naturally poor or exhausted by cropping. Early ripening or maturity of the wheat, such as is brought about by the gradual lessening of the supply of soil moisture (which of course would also mean the cutting off of the soil food supply) we are of opinion, results in a hard, glutinous wheat. On the other hand, prolonged vegetative growth as induced by excessive moisture defers ripening and allows the further deposition of starch, resulting in a more or less soft kernel.

Mr. Mooney in this year (1906) undertook a further series on 'breaking' and 'summer-fallow,' using as seed Red Fife wheat grown at Hartney, a wheat of the very finest quality, clean, bright, hard and translucent. The composition of this seed wheat and its products on 'breaking' and 'summer-fallow' may be stated as follows :—

Series 3, 1906—

	Protein (N x 5·7) per cent
'F' wheat used as seed grown at Hartney, Man...	13·91
'G' product of 'F' on 'breaking'..................	12·14
'H' product of 'F' on 'summer-fallow'.............	11·78

These results only add confirmation to the theory advanced in so far as they show a general deterioration or softening of grain, a reduction of protein to the extent approximately, of two per cent. To the eye, wheats 'G' and 'H' are very much alike. showing about the same proportion of soft or starchy kernels. The parent wheat 'F' shows no soft grain. The percentage of protein in the wheat from 'breaking' is ·36 per cent higher than in that from the 'summer-fallow'; the difference is not a large one, but it is not in the same direction as that hitherto observed, and consequently does not support our views as already enunciated. Possibly some more careful examination of the local conditions might reveal the cause of this apparent departure, but in the absence of any certain or direct information as to this we hesitate to offer any explanation. All we can say is that the same tendency for hard wheat to deteriorate in this district has shown itself, a tendency, we believe, caused by the generally speaking larger amount of moisture present in the soil during the ripening period as compared with those of the soils, say, of districts farther south and in which the very highest grade of wheat is produced.

During the past season (1907) the investigation was continued, sowing both a hard and soft wheat on (*a*) stubble, (*b*) breaking, and (*c*) summer-fallow. We had hoped to obtain decisive information from these experiments, or at all events some data that might confirm or refute our conjecture, but unfortunately, we have nothing satisfactory to show in the way of results. The soils had their moisture content determined periodically, but the season was so abnormal that the analysis of the grain could not be put forward as of any value for the purposes of the present consideration. The spring was very late and the seeding was delayed until after May 1. Heavy snows and rains characterized the early part of the season and indeed the whole summer was marked by low temperatures and unusual precipitations. While the wheat was still in the 'dough' heavy frosts occurred and the grain never filled out. Under those unfortunate circumstances we feel it better to omit entirely all data from the 1907 experiments.

Mention may also be made that similar experiments were begun this last season at Tisdale, Sask., through the kindness and co-operation of Mr. J. C. Readey, of that place. As far as results are concerned, however, we can only chronicle a repetition of the failure at Valley River. A wet, cold season and early frosts resulted in wheat that could only be graded as 'feed' and this we thought could not be regarded as a natural, normal product of the soils under experiment. Next year we hope to resume the work at both these points and shall probably extend the research into Alberta.

FROSTED WHEAT.

The unfavourable climatic conditions—low temperature with excessive rains—which prevailed during a considerable period of the growing season last year in many sections of the Northwest prevented that rapid development of the wheat plant which is so characteristic in that portion of the Dominion. Early autumnal frosts ensued and caught large acreages of wheat while still in the 'dough' stage, or at all events before the grain was fully matured at once arresting the ripening processes. Thus it was that considerable quantities of frosted or frozen grain, which must be regarded as more or less immature wheat, were harvested and put on the market. Since such wheat, when the injury is severe, is not suitable for milling purposes it became a question of importance to ascertain its value for stock feeding. In such an inquiry it would naturally at the outset be asked, in what particulars of composition does frosted wheat differ from sound, normally ripened grain.

Some years ago we showed that frosted or frozen wheat was characterized by a slightly higher nitrogen-content than similar wheat which under more favourable climatic conditions had advanced normally to maturity. The explanation of this large proportion of nitrogen lies in the fact that frosted wheat is immature. The deposition of starch in the kernel, the development of the endosperm, takes place more rapidly during the final stages of ripening than earlier in the growth of the grain, necessarily reducing the percentage of nitrogen in the fully ripened wheat.

But does this higher nitrogen-content necessarily mean a higher feeding value for frosted wheat? Nitrogen is the essential element of protein (albuminoids), the most valuable constituent of fodders and feeding stuffs, but all the nitrogen of the frosted grain may not be present in the true albuminoid form. In the earlier stages of the seed's development, it exists in part as amides and other compounds of less feeding value. As the seed ripens this non-albuminoid nitrogen is converted into the more valuable or true proteid condition and form. Thus it is possible for the fully mature grain with the lower percentage of nitrogen to be more nutritious than the unripe grain with its somewhat higher nitrogen-content. In this investigation, therefore, it was of first importance to determine the percentages of albuminoid and non-albuminoid nitrogen in the frosted wheat, and compare them with similar data from normally, fully ripened wheat. Of the eleven wheats selected for this investigation, three were considered as sound, i.e., fully ripened and free from frost, four were classified as frosted, and four as badly frosted. They are all of the harvest of 1907. The analytical results are presented in the following table, and in connection therewith it may be pointed out that differences of less than one per cent in the column 'Percentage of total nitrogen in form of albuminoid nitrogen' must necessarily be regarded as within the limit of experimental error.

NITROGENOUS COMPOUNDS CONTAINED IN WHEATS—1907.

(Percentage in water-free sample.)

Number.	Designation of Sample.	Wheat Grown at	Nitrogen.* Albuminoid.	Nitrogen.* Non-Albuminoid.	Nitrogen.* Total.	Percentage of total Nitrogen in form of Albuminoid Nitrogen.
	Sound Wheats.					
1..	Red Fife...........	Ex. Farm, Brandon, Man...	2·21	·08	2·29	96·5
2..	Red Fife 'M'........	" " Ottawa, Ont....	2·56	·12	2·68	95·5
3..	Dawson's Golden Chaff	" " Ottawa, Ont....	2·26	·14	2·40	94·1
	Frosted Wheats.					
4..	Percy 'A'........	" " Indian Head, Sask.	1·81	·06	1·87	96·7
5..	Chelsea..............	" " " "	1·86	·13	1·99	93·4
6..	Red Fife 'H'........	" " " "	2·25	·20	2·45	91·8
7..	Marquis..............	" " " "	2·24	·23	2·47	90·7
	Badly Frosted Wheats.					
8..	Red Fife.............	J. C. R. Tisdale, Sask......	1·91	·21	2·12	90·1
9..	Feed, No. 1..........	Saskatchewan........	1·94	·24	2·18	88·9
10..	" No. 2..........	"	2·19	·40	2·59	84·5
11..	" No. 3..........	"	1·99	·58	2·37	83·9

Of the three sound, i.e., normally ripened, wheats two are Red Fife (a spring wheat)—one grown at Brandon, Man., the other at Ottawa, Ont. The third sample is Dawson's Golden Chaff (a winter wheat), grown at Ottawa, Ont. If the present results are representative of normally and fully matured wheats in general, and we think they are, they may be taken as indicating that in such grain about ninety-five per cent of the total nitrogen exists in the true albuminoid form.

The four samples of frosted wheat were furnished by the Cerealist for this investigation. They are all spring wheats, one of them Red Fife, and three of them cross-bred sorts from Red Fife. All were grown at Indian Head, Sask. The evidences of frost, in shrunken grain and shrivelled skin, were well marked. Three of these wheats (Nos. 5, 6 and 7) show percentages of total nitrogen in albuminoid form ranging from 90·7 to 93·4, which seems to prove that in frosted wheats there is a considerably higher proportion of non-albuminoid nitrogen than in fully ripened grain. In the case of Percy A. we obtained a figure similar to those from the mature frost-free wheats, and an inspection of the wheat shows a fairly plump though small kernel with a slightly shrivelled skin, pointing, the writer thinks, to a more advanced stage of maturity at the time of freezing than the other members of the group possessed. Red Fife H. and Marquis, particularly exhibit in a marked degree that peculiar 'green' and horny appearance so characteristic of the frozen immature wheat.

The group which we have labelled 'Badly frosted' comprises four samples of Red Fife grown in Saskatchewan, and all of which are quite unsuited for milling purposes owing to the effect of frost.

Judging from appearances, one would say that the grain had been overtaken by frost while still quite immature. A further falling off in the proportion of albuminoid nitrogen is to be observed—the percentages in this group ranging from 83·9 to 90·1.

There seems, therefore, fairly satisfactory evidence to show that in 'frosted' wheat a somewhat larger proportion of non-albuminoid compounds is present than in fully

* The 'total' nitrogen was obtained by the Gunning modification of the Kjeldahl method, the 'albuminoid' nitrogen was determined according to the Stutzer method with the use of cupric hydroxide.

ripened grain. This is what might be expected from the knowledge that frosted wheat is in a degree immature. These non-albuminoid nitrogenous compounds (amides, chiefly) are of less nutritive value than gluten (true albuminoid) and hence, from this standpoint the frosted wheat is inferior to the mature grain, both having the same total nitrogen-content. The difference, however, is not a large one and we should not expect that, considered simply from the chemical point of view, the practical feeding value of the frosted grain would be far behind that of wheat normally ripened. Indeed it might perhaps be urged respecting some samples of frosted grain that their higher nitrogen-content would allow them to rank as superior, in spite of the fact that a certain proportion of this nitrogen is present in the non-albuminoid condition. The value of any food-stuff cannot, however, be accurately guaged from the chemical analysis and the reader is, therefore, referred to the results of the actual feeding tests detailed in the Report of the Agriculturist for the present year.

It may, however, be pointed out, that frozen wheat is extremely hard and horny and consequently may in part, even though ground to fine powder, pass through the animal unattacked. For this reason, apparently, it has not proven very satisfactory for dairy cows and steers, though excellent results have been obtained from it in pork production. Probably soaking or scalding might overcome this objectionable feature and enhance its value. Further, experience with wheat feeding in general would point to the desirability of mixing the finely ground frosted wheat with some more bulky feed, say bran or ground oats, to prevent the formation, from the wheat, of a glutinous ball in the stomach that would resist the action of the digestive fluids.

FLOUR FROM FROSTED WHEAT.

Having learnt that a notable part of the nitrogen of frosted wheat exists in the non-albuminoid form it became of considerable interest to discover if the flour of such wheat would show the same peculiarity. To this end the Cerealist kindly prepared 'straight' flours in the experimental flour mill from several of the wheats in the first two groups—sound and frosted—and in them we determined the albuminoid and non-albuminoid nitrogen, exactly as in the case of the wheats.

NITROGENOUS COMPOUNDS CONTAINED IN FLOURS—1907.

(Percentage in water-free sample.)

Number.	Designation of Sample.	Wheat Grown at	Nitrogen. Albuminoid.	Nitrogen. Non-Albuminoid.	Nitrogen. Total.	Percentage of total Nitrogen in form of Albuminoid Nitrogen.
	From Sound Wheats.					
1..	Dawson's Golden Chaff	Ex. Farm, Ottawa, Ont.....	2·03	·03	2·06	98·5
2..	Red Fife 'M'........	" " "	2·43	·10	2·53	96·0
	From Frosted Wheats.					
3..	Chelsea	" " Indian Head, Sask.	1·85	....	1·84	....
4..	Marquis	" " "	2·24	03	2·27	98·7
5..	Red Fife 'H'.	" " "	2·30	·04	2·34	98·3
6..	Percy 'A'......	" " " "	1·63	·06	1·69	96·4

1. It is noticeable that the flour contains a larger proportion of its nitrogen in the true albuminoid form than does the wheat from which it has been milled. This refers to both sound and frosted samples.

2. The proportion of total nitrogen in the form of albuminoid nitrogen is apparently as large in the flours from frosted as from sound wheats. This points to the elimination from the former, during the milling, of the parts containing the non-albuminoid compounds. It will probably be found, that these for the most part reside in, or are associated with, the embryo, which with the bran coats are separated in the milling.

3. The amount of total nitrogen of the wheat is larger than that of its flour, from the fact that the bran coats are richer in this element than the endosperm from which the flour is obtained. There is, of course, in this announcement nothing new, it is simply made that the general reader may have his attention drawn to the uniformly higher nitrogen results for the wheats and the reason why such were obtained.

POTATOES.

Certain chemical work of a preliminary character has been done during the past two seasons upon this important and valuable crop, to trace, if possible, such changes of composition that may take place during the growth or maturing of the tuber in the ground and subsequently during storage, as well as to determine as far as might be practicable any differences, from the nutritive standpoint, that might exist between certain varieties.

The determinations included the dry matter, ash and nitrogen in the protein and non-protein form.

Twelve well known varieties were supplied for this work by Mr. Macoun, the Horticulturist, whose remarks upon the relative values of the potatoes from the point of view of table quality are given in a subsequent paragraph. The varieties examined were Carman No. 1, Wee MacGregor, Dreer's Standard, Money Maker, Late Puritan, Sabean's Elephant, Rural Blush, Burnaby Mammoth, Canadian Beauty, Pearce, I.X.L. and Dr. Maerker.

The first series for analysis was obtained on August 8, 1906, at which date the tubers were held to be fit for cooking. The second series for analysis was dug on October 10, 1906, when the whole crop was taken up and stored. A third analysis was made at the close of the storage period, May 10, 1907.

DRY MATTER IN POTATOES.

(Varieties named in order of table quality.)

Variety.	First Series. (8·8·06)	Second Series.* (9 10·06)	Third Series.† (10·5·07)
Carman No. 1	21·97	20·54	20·38
Wee MacGregor	20·98	18·69	21·23
Dreer's Standard	21·62	20·51	21·44
Money Maker	17·48	19·54	18·51
Late Puritan	20·27	21·85	20·31
Sabean's Elephant	21·65	21·80	20·97
Rural Blush	22.26	20·54	20·67
Burnaby Mammoth	21·40	21·48	23·38
Canadian Beauty	21·19	21·12	20·12
Pearce	21·14	22·40	23·45
I. X. L.	20·53	20·36	21·73
Dr. Maërker	20·97	21·93	25·22
Average	20·96	20·90	21·45

* Going into storage. † At close of storage period.

DRY MATTER.

The data given in the foregoing table are of considerable interest in that they show—

(1) That the larger number of the varieties analysed at the time of the first digging (August 8) had approximately the same dry matter content. With the exception of Money Maker, 17·48 per cent, Carman No. 1, 21·97 per cent, and Rural Blush, 22·26 per cent, the majority of the results are almost close enough to the average, 20·96 per cent, to be within the limit of experimental error.* This similarity may be due in part to the fact that the tubers selected were as far as practicable at the same stage of maturity. In this connection it may be added that we cannot present any data to support the view that the smaller potatoes contain more water than larger tubers.

(2) That comparing the percentages of dry matter in the potatoes dug October 9 with those of August 8, just discussed, it will be observed that there has been no general increase in this constituent, though in certain instances (Money Maker, Dr. Maerker, Pearce, Late Puritan) there has been a noticeable advance. These increases are offset by decreases in other varieties (chiefly Dreer's Standard, Rural Blush, Carman No. 1, and Wee MacGregor), so that the average dry matter content (20·90 per cent) is practically identical with that of August 8. There is no evidence, therefore, from this investigation, that the tubers dug after the vines have been dead for some time necessarily contain more dry matter (starch) than those taken up two months earlier and while the potato plant is still green and vigorous.

(3) That the tubers at the close of the storage period, May 5, were, on the whole, somewhat richer in dry matter than when dug in the preceding October. There are one or two apparent exceptions to this general trend, but the testimony they furnish is not sufficient to throw doubt upon the conclusion that there is an increase in dry matter during storage.

THE RELATION OF COMPOSITION TO QUALITY.

In the following notes Mr. W. T. Macoun, the Horticulturist, has set forth what he considers the table qualities of the varieties analysed, grouping them into four classes, as follows:—

RELATIVE TABLE QUALITY OF POTATOES.

'The twelve varieties under discussion do not all differ perceptibly in table quality, but they may be divided into four groups :

Group 1.—Carman No. 1, Wee MacGregor, Dreer's Standard, Money Maker, and Late Puritan, all are much alike in quality, being medium grained, dry, mealy and good in quality. These are the best of the twelve.

Group 2.—Sabean's Elephant and Rural Blush. These are coarser in the grain than the above but are dry, mealy and of good table quality.

Group 3.—Burnaby Mammoth, Canadian Beauty, Pearce and I.X.L., are not so dry nor mealy as those in Group 1 and Group 2, and hence are not so desirable for table use.

Group 4.—Dr. Maerker. This is distinctly inferior in quality to the preceding eleven varieties, rarely cooking dry and mealy and not desirable for table use.

According to certain authorities there appear to be two ideals in the matter of quality: 'white-fleshed, rich in starch, medium in size, oval and smooth and yellow-fleshed relatively poorer in starch and richer in protein, small in size.' It is held that

* In the determination of the dry matter, the tubers, twelve in number, for each sample, were cut in thin slices and these again cut across, forming small cubes or prisms of the material. The drying was effected in a water oven at a temperature of about 96 degrees C. until a constant weight was obtained.

the former yields on cooking a dry mealy, floury potato and the latter a wet, 'sad' potato.

Accepting the Horticulturist's classification, which is undoubtedly based on the more popular ideal, we may first inquire how far any relationship between quality and the proportion of dry matter may be discernible. We fail to find any relation, nor can we say that the data of table 1 (respecting the dry matter) throw any light upon quality.

In the following table fuller details respecting the composition of the potatoes analysed are given, and these may now be considered in relation to quality.

COMPOSITION OF POTATOES

Analyses of Samples as Received (Fresh Material.)

Variety.	First Series.				Second Series.				Third Series.			
			Nitrogen.				Nitrogen.				Nitrogen.	
	Moisture.	Ash.	Total.	Albuminoid.	Moisture.	Ash.	Total.	Albuminoid.	Moisture.	Ash.	Total.	Albuminoid.
Carman No. 1	78·03	1·10	·350	·27	79·46	1·09	·37	·20	79·62	1·29	·42	·22
Wee MacGregor.....	79·02	1·22	·364	·28	81·31	1·14	·32	·18	78·77	1·34	·43	·27
Dreer's Standard......	78·38	1·13	·385	·17	79·49	1·15	·40	·22	78·56	1·20	·44	·24
Money Maker	82·52	1·15	·374	·24	80·46	1·23	·40	·23	81·49	1·40	·41	·19
Late Puritan	79·73	1·22	·301	·19	78·15	1·23	·37	·21	79·69	1·27	·36	·20
Sabean's Elephant	78·35	1·16	·307	·17	78·20	1·26	·36	·21	79·03	1·14	·36	·18
Rural Blush	77·74	1·26	·372	·24	79·46	1·30	·42	·21	79·32	1·40	·42	·21
Burnaby Mammoth...	78·60	1·27	·287	·22	78·52	1·25	·40	·24	76·62	1·56	·42	·26
Canadian Beauty	78·81	1·22	·319	·25	78·88	1·22	·38	·21	79·88	1·31	·37	·23
Pearce................	78·86	1·11	·311	·21	77·60	1·26	·28	·20	76·55	1·38	·40	·22
I. X. L...........	79·47	1·18	·307	·22	79·64	1·21	·33	·20	78·27	1·40	·38	·22
Dr. Maerker..	79·03	1·28	·333	·23	78·07	1·14	·37	·21	74·78	1·74	·43	·28
Average	79·04	1·19	·334	·22	79·10	1·20	·37	.21	78·55	1·37	·40	·23

As regards the ash-content but very slight differences exist between the varieties. The percentages of this constituent in both first and second series are very close, so that no marked tendency either toward increase or decrease in mineral matter during the period, August 8th to October 9th, is observable. The average percentage of ash in the first series is practically identical with that in the second series. During storage there has been a slight increase, evidently arising from the loss of moisture that had taken place during that period.

The nitrogenous compounds comprise the albuminoids (protein) and the non-albuminoids and it has been thought by some that the amount of the former—or possibly the ratio of the albuminoid to non-albuminoid compounds—affects the quality of the potato.

Considering first the total nitrogen present (representing all the nitrogenous bodies) a remarkable uniformity is seen to exist in the first series; the data for the several varieties are, with a few exceptions, within the limit of experimental error when compared with the average of the whole series. In the second series the total nitrogen on the whole has increased slightly, but still as in the first series the differences between the several members are but small. In the third series there is likewise a further

slight increase observable throughout, but again there are no marked differences between the varieties.

In the albuminoid nitrogen, practically two thirds of the total, the varieties do not show quite the same uniformity, more particularly in the first series; yet we are unable from these results to establish any co-relation between albuminoids and table quality. In the second and third series especially the data are very close. A general, but slight increase is to be noticed in the potatoes at the close of the storage period, probably due to the drying out to which we have already referred.

COMPOSITION OF THE DRY MATTER.

In order to bring out more prominently the facts regarding these nitrogenous compounds, the following table has been constructed, in which the results are given as percentages on the dry matter. The ratio of non-albuminoid to albuminoid nitrogen has also been calculated.

Nitrogenous Compounds in Potatoes.

(Results calculated to water-free basis).

Variety.	First Series.				Second Series.				Third Series.			
	Nitrogen.				Nitrogen.				Nitrogen.			
	Albuminoid.	Total.	Ratio of non-albuminoid to albuminoid.	Ash.	Albuminoid.	Total.	Ratio of non-albuminoid to albuminoid.	Ash.	Albuminoid.	Total.	Ratio of non-albuminoid to albuminoid.	Ash.
Carman No. 1..	1·23	1·59	3·41	5·00	0·97	1·31	2·85	5·31	1·08	2·06	1·10	6·33
Wee MacGregor.....	1·33	1·73	3·32	5·81	0·96	1·71	1·28	6·04	1·27	2·02	1·69	6·31
Dreer's Standard......	0·78	1·79	0·77	5·22	1·07	1·90	1·29	5·60	1·12	2·05	1·20	5·59
Money Maker	1·35	2·07	1·87	6·59	1·17	2·04	1·34	6·29	1·02	2·21	0·86	7·02
Late Puritan.........	0·93	1·48	1·69	6·01	0·96	1·68	1·33	5·63	0·98	1·77	1·24	6·25
Sabean's Elephant	0·78	1·41	1·24	5·36	0·96	1·65	1·39	5·78	0·86	1·71	1·01	5·43
Rural Blush	1·07	1·67	1·78	5·66	1·02	2·04	1·00	6·32	1·01	2·03	0·99	6·77
Burnaby Mammoth...	1·04	1·34	3·46	5·92	1·11	1·86	1·48	5·81	1·11	1·79	1·63	6·67
Canadian Beauty	1·18	1·51	3·58	5·75	0·99	1·79	1·21	5·77	1·14	1·83	1·65	6·51
Pearce........	0·99	1·42	2·30	5·25	0·89	1·25	2·47	5·63	0·93	1·70	1·20	5·88
I. X. L...............	1·07	1·49	2·54	5·74	0·98	1·62	1·53	5·94	1·01	1·74	1·38	6·44
Dr. Maerker.....	1·09	1·58	2·22	6·10	0·96	1·68	1·33	5·19	1·11	1·70	1·88	6·89
Average..........	1·07	1·59	2·35	5·70	1·00	1·71	1·54	5·78	1·05	1·88	1·32	6·34

Differences are to be observed, but these fail to help in showing any relation between the nitrogen compounds and quality. It is worthy of interest, however, to note (1) that the total nitrogen, judging from the averages, increases slightly from the first to the third series, (2) that albuminoid nitrogen remains practically constant throughout, (3) that the ratio of non-albuminoid to albuminoid nitrogen fluctuates considerably in all the series, but particularly so in the first series. This variation is apparently eccentric and not in any accord with quality. (4) That this ratio in the third series (after storage) is less than in the preceding series, owing to the albuminoid nitrogen remaining practically constant while the total nitrogen somewhat increases.

LOSS ON STORAGE.

In table 4 are presented data to show the loss in weight on storage. The potatoes were kept in baskets placed in the cellar of one of the farm buildings, where fairly good conditions prevailed. It was cool and dry, with sufficient ventilation to prevent heating without unduly drying out the tubers.

LOSS ON STORAGE OF POTATOES.

Variety.	Initial weight of 36 potatoes. 9-10-06.	Percentage of Loss on Keeping.			
		During first 87 days. 4-1-07.	During subsequent 101 days. 15-4-07.	During subsequent 25 days. 10-5-07.	Total loss.
	Grammes.				
Pearce	3,622·5	10·3	2·0	0·6	12·9
Dr. Maerker	3,514·5	13·1	6·1	0·9	20·1
Rural Blush	3,169·5	7·1	2·8	0·4	10·3
Wee MacGregor	2,989·3	7·3	3·2	0·4	10·9
Sabean's Elephant	2,712·7	8·0	2·7	0·6	11·3
Canadian Beauty	2,509·2	6·4	2·1	0·5	9·0
Dreer's Standard	2,424·6	9·0	2·3	0·6	11·9
I. X. L.	2,352·4	6·8	2·8	0·6	10·2
Late Puritan	2,260·4	7·0	2·5	0·5	10·0
Carman No. 1	2,223·3	7·9	2·3	0·5	10·7
Burnaby Mammoth	1,207·1	7·6	2·6	0·5	10·7
Money Maker	1,204·7	6·4	2·4	0·6	9·4
Average loss		8·1	2·8	0·6	11·5

The order given is that of the weight, and hence practically the size, of the tubers. Unfortunately potatoes of the same size for all the varieties could not be obtained. During the first eighty-seven days the average loss for the series was less than 10 per cent (8·1 per cent), the marked exception being Dr. Maërker, which is the latest potato of those examined. It showed 13·1 per cent. Pearce gave the next highest loss, and it is significant that these varieties furnished the largest tubers of the series.

In 101 days following the first weighing the loss, with the exception of Dr. Maerker, was between 2 per cent and 3 per cent, and very fairly constant. Dr. Maerker lost 6·1 per cent.

The third period of 25 days (April 15 to May 10) gave a further loss in the neighbourhood of 0·5 per cent. Dr. Maerker again showed the greatest loss.

This experiment, therefore, conducted from October to May, would go to prove that under ordinarily good conditions mature potatoes lose in the neighbourhood of 10 per cent of their weight, which as we have seen is practically due to the drying out of the tubers. Very late (immature) potatoes may lose twice that percentage. The probabilities are, that kept in large quantities in bins or bags under similar conditions to those described the percentage of loss would be somewhat less than that here recorded.

THE RELATIVE VALUE OF FIELD ROOTS.

The yield per acre, the composition and the keeping qualities, are probably the three chief factors to be considered in the choice or selection of the variety to be sown. It is with respect to the second of these factors, composition, that the Chemical Division has for a number of years past been accumulating data, and there is now pre-

sented in the results from the crop of 1907, the eighth series of figures obtained from the analysis of mangels, turnips and carrots grown on the Experimental Farm, Ottawa.

The differences in feeding value between varieties in the same class of farm roots are largely due to inherited qualities, and data to support this will be presented later in this report. The 'breed' factor, however, is not the only one, for, comparing results year by year shows unmistakably the important influence of seasonal conditions on the composition of roots, and especially as regards sugar content—the constituent of prime value in roots from the feeding standpoint. There is, however, in this connection one unsatisfactory feature—the difficulty, or in some cases, the impossibility of identifying with certainty year by year many of the varieties. The frequent change in name of many well known varieties by seedsmen makes their recognition sometimes a matter very largely of conjecture, and it is well to bear this in mind when consulting the data with a view of comparing the values of the different roots in any one class.

Mangels.—Ten varieties, representing for the most part those which had given the best field results in previous trials on the Experimental Farm were analysed.

ANALYSIS of Mangels, C.E.F., Ottawa, 1907.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p. c.	p. c.	p. c.	Lbs.	ozs.
Yellow Intermediate	85·39	14·61	8·28	2	4
Perfection Mammoth Long Red	86·28	13·72	8·17	2	13
Giant Half Sugar	86·28	13·72	8·40	2	4
Crimson Champion	87·04	12·96	8 63	3	0
Mammoth Red Intermediate	87·28	12·72	7·25	2	3
Gate Post	87·47	12·53	7·25	3	10
Prize Mammoth Long Red	87·89	12·11	7·92	2	10
Selected Yellow Globe	88·29	11·71	6 26	2	15
Giant Yellow Intermediate	88·44	11·56	6·09	2	14
Giant Yellow Globe	89·22	10·78	6·34	2	7

The percentages of dry matter range from 14·61 to 10·78, a difference practically equivalent to 26 per cent of the total dry matter. The sugar content, similarly, is between 8·28 per cent and 6·34 per cent, the difference amounting approximately to 23 per cent of the total sugar.

The averages for the past four years are as follows :

MANGELS—AVERAGE COMPOSITION 1904-1907.

Year.	Number of Varieties Analysed.	Average Weight of One Root.		Dry Matter.	Sugar.
		Lbs.	ozs.	p. c.	p. c.
1904	10	2	11	11·69	6·62
1905	17	3	9	10·04	4·67
1906	16	2	7	11·63	5·93
1907	10	2	11	12·64	7·46

Turnips.—Fourteen (14) varieties were analysed, of which ten (10) were among those examined in 1906. The differences in dry matter and sugar are not so great as with the mangels, a feature remarked in the work of previous seasons.

ANALYSIS of Turnips, C.E.F., Ottawa, 1907.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of One Root.	
	p. c.	p. c.	p. c.	Lbs.	ozs.
Skirvings	88·48	11·52	1·01	2	15
Bangholm Selected	89·48	10·52	1·37	2	15
Kangaroo	89·57	10·43	1·10	2	3
Mammoth Clyde	89·64	10·36	1·52	2	14
Magnum Bonum (B)	89·67	10·33	0·61	3	5
Carter's Elephant	89·84	10·16	0·92	4	4
Hartley's Bronze Top	89·90	10·10	1·22	3	14
Halewood's Bronze Top	89·95	10·05	1·01	3	3
Jumbo	89·99	10·01	1·01	3	2
Brown's Universal	90·02	9·98	1·22	3	8
Magnum Bonum (E)	90·07	9·93	2·18	3	8
Good Luck	90·39	9·61	0·51	3	5
Perfection Swede	90·49	9·51	0·90	3	10
Hall's Westbury	90·60	9·40	0·89	3	12

Bringing together the average results from the crops of the past three seasons we obtain :—

TURNIPS—Average Composition 1905–1907.

Year.	Number of Varieties Analysed.	Average Weight of one Root.		Dry Matter.	Sugar.
		Lbs.	ozs.	p. c.	p. c.
1905	20	2	13	10·09	1·10
1906	20	1	10	12·18	1·78
1907	14	3	5	10·14	1·11

The results of 1907 are, as regards dry matter and sugar, practically identical with those of 1905. The data for 1906 furnish evidence of the influence of size on composition, the small weight of the root being accompanied by a markedly high dry matter and sugar content.

Carrots.—Of the varieties analysed the 'White Belgian' ranks first as to percentage of dry matter, exceeding the next lower, Half Long Chantenay, by one per cent. In 1905, these two varieties occupied the same rank and the same relation to one another. The differences in nutritive value, however, between the members of the series are not large, as will be evident from an inspection of the following tabulated data.

ANALYSIS of Carrots, C.E.F., Ottawa, 1907.

Variety.	Water.	Dry Matter.	Sugar in Juice.	Average Weight of one Root.	
	p. c.	p. c.	p. c.	Lbs.	ozs.
White Belgian	88·52	11·48	3·10	1	0
Half Long Chantenay	89·45	10·55	3·83	0	13
Mammoth White Intermediate	89·59	10·41	2·72	0	13
Improved Short White	90·02	9·98	2·82	1	3
Giant White Vosges	90·18	9·82	3·03	1	4
Ontario Champion	90·43	9·57	2·60	1	5

For the three seasons 1905-6-7, the averages are as follows :—

CARROTS—Average Composition 1905–1907.

Year.	Number of Varieties Analysed.	Average Weight of one Root.		Dry Matter.	Sugar.
		Lbs.	ozs.	p. c.	p. c.
1905	11	1	3	10·25	2·52
1906	10	1	2	10·59	3·36
1907	6	1	1	10·30	3·02

A marked uniformity is to be observed, both as regards weight and composition ; the differences in percentage of dry matter between the roots of the three seasons are negligible and well within the limits of experimental error.

INFLUENCE OF INHERITED QUALITIES.

Nine years ago two varieties of mangels—Gate Post and Giant Yellow Globe—were selected to be grown (on practically identical soil) at the Experimental Farm, Ottawa, and were analysed season by season, to ascertain how far inherited qualities might persist and to what extent varying seasonal conditions might affect composition. These two mangels represent, so far as our work is concerned, the richer and the poorer varieties respectively, and the results show that while the season has repeatedly exerted its influence upon the composition of the varieties, in increasing or decreasing the dry matter and sugar, a well marked difference—and always in the same direction—has invariably been present, the 'Gate Post' being the superior root.

DRY Matter and Sugar in Gate Post and Giant Yellow Globe Mangels.

Season of Growth.	Gate Post.				Giant Yellow Globe.			
	Average Weight of one Root.		Dry Matter.	Sugar in Juice.	Average Weight of one Root.		Dry Matter.	Sugar in Juice.
	Lbs.	ozs.	p. c.	p. c.	Lbs.	ozs.	p. c.	p. c.
1900	..	..	11·14	6·15	..	..	8·19	2·64
1901	2	9	9·41	4·15	3	3	9·10	4·08
1902	3	2	13·90	9·39	3	9	10·24	5·24
1903	3	3	12·93	7·38	3	13	10·89	6·17
1904	2	14	12·64	7·62	2	13	9·24	5·26
1905	2	13	12·07	6·83	3	12	8·64	3·55
1906	2	2	12·90	6·59	1	8	12·73	6·45
1907	3	10	12·53	7·25	2	7	10·78	6·34
Average for 8 years			12·19	6·92			9·97	4·97

In these data there is, the writer thinks, distinct and satisfactory evidence of the influence of inherited qualities, indicating that in mangels at least, the 'breed' factor may be one of considerable importance. The nutritive value of farm roots is dependent on the percentage of dry matter and sugar present, and this research, in common with that upon roots in general, points to the possibility of selecting varieties of superior quality and to a reasonable certainty that their relative position will be maintained.

SUGAR BEETS FOR FACTORY PURPOSES.

In accordance with our custom, the three leading varieties of factory sugar beets, Vilmorin's Improved, Klein Wanzleben and Très Riche, as grown at the several Experimental Farms, have again been analysed.

SUGAR BEETS Grown on the Dominion Experimental Farms, 1907.

Variety.	Locality.	Percentage of Sugar in Juice.	Percentage of Solids in Juice.	Co-efficient of Purity.	Average Weight of one Root.	
					Lbs.	Ozs.
Vilmorin's Improved	Ottawa, Ont	16·49	18·46	89·3	1	2
"	Brandon, Man	16·75	19·57	85·6	1	4
"	Indian Head, Sask	17·09	20·49	83·4	1	3
"	Lacombe, Alta	13·39	17·29	77·4	1	9
"	Agassiz, B.C	18·86	20·87	90·3	1	3
Klein Wanzleben	Ottawa, Ont	14·67	18·11	81·0	1	4
"	Brandon, Man	17·86	21·13	84·5	1	4
"	Indian Head, Sask	15·03	18·60	80·8	1	2
"	Lacombe, Alta	13·93	17·94	77·6	1	5
"	Agassiz, B.C	17·65	20·26	87·1	1	7
Très Riche	Ottawa, Ont	15·16	18·06	83·9	1	11
"	Brandon, Man	16·38	19·17	85·4	1	2
"	Indian Head, Sask	15·65	19·00	82·3	1	3
"	Lacombe, Alta	12·72	16·69	76·2	1	8
"	Agassiz, B.C	16·43	18·86	87·1	1	4

Considered as a whole, these are probably the most satisfactory results that we have been able to present for some seasons; with the exception of the roots from

Lacombe, Alberta, where the season was unfavourable, all the beets examined were of excellent quality and quite suited for factory purposes.

Among the best analysed were those from Brandon, Man., and Indian Head, Sask., a fact that is noteworthy, as our results in the past have not, as a rule, indicated these districts as suitable for the production of either a rich or pure beet.

Early frosts, following an exceedingly wet autumn, severely injured the crop at Nappan, N.S., so that no results were obtained this season for that locality.

In the following table we present the average results as regards the percentage of sugar in juice, from the three varieties, Vilmorin's Improved, Klein Wanzleben, and Très Riche, grown on the Experimental Farms for the past six years:—

AVERAGE Percentage of Sugar in Juice in Sugar Beets Grown on the Experimental Farms, 1902–1907.

Locality.	1902.	1903.	1904.	1905.	1906.	1907.
Nappan, N.S.	15·87	15·33	14·41	16·52	17·08	....
Ottawa, Ont.	16·77	15·34	16·91	12·45	14·37	15·44
Brandon, Man	....	11·36	16·62	11·09	15·50	16·99
Indian Head, Sask.	15·15	16·54	15·24	14·94	14·91	15·92
Lacombe, Alta.	....	....	....	....	....	13·34
Agassiz, B.C.	....	17·44	8·10	17·32	14·23	17·65

FODDERS AND FEEDING STUFFS.

Though not making any systematic or comprehensive examination of the feeding stuffs on the market, we have, according to our habit in the past, analysed a considerable number of these materials in order the more intelligently to advise those writing us for information respecting their composition and nutritive values. And it may be remarked in passing that the interest evinced in this subject of the comparative value of feeds has been greater this past winter than usual, owing, no doubt, to the high prices generally asked and consequent, we presume, upon the shortage in fodder crops following the drought last season in many parts of the country.

The table of data present all the essential particulars; the supplementary notes, however, in a measure interpret the analytical results and furnish additional information of interest.

FEEDING STUFFS, 1907.

Number.	Name.	Particulars.	Moisture.	Crude Protein.	Fat or Oil.	Carbo-hydrates.	Fibre.	Ash.
			p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
	Corn products—							
1	Corn Bran from distillery	H. C. Emerson, Corbyville, Que.	7·89	10·25	2·65	57·53	16·02	5·66
2	Corn Meal	I. H. T. Dunfield, Portage, N.B.	11·70	8·00	4·49	72·57	2·02	1·22
3	Kiln-dried Corn Meal	H. M. Fowlds & Son, Hastings, Ont.	11·64	9·06	4·48	71·74	1·83	1·25
4	Gluten Feed	The Brantford Starch Works, Brantford, Ont.	6·32	14·50	9·48	62·84	6·05	·81
5	"	The Edwardsburg Starch Co., Cardinal, Ont.	9·38	21·44	3·90	59·21	5·28	·79
6	Jersey Brand Gluten Meal	The St. Lawrence Starch Co., Port Credit, Ont.	5·81	14·94	2·91	71·95	3·56	·83
7	Corn Oil Cake Meal	" " "	10·09	22·25	11·78	43·23	9·53	3·12
8	Gluten Feed	The Edwardsburg Starch Co., Cardinal, Ont.	5·68	20·95	3·11	62·02	7·18	1·06
9	Gluten Meal	" " "	13·29	33·96	2·97	48·07	·93	·78
10	Corn Bran ('Dry Feed')	" " "	9·10	10·08	4·32	64·16	11·72	·62
11	Corn Oil Cake	" " "	10·96	20·45	11·45	45·68	9·22	2·24
	Wheat products—							
12	Bran	Wilson & Co., Arden, Man.	5·99	12·81	4·17	55·35	15·74	5·94
13	Feed Wheat (frozen) No. 2	Agricultural Division, C. E. Farm, Ottawa, Ont.	9·96	13·21	2·51	68·81	3·38	2·13
14	Feed Wheat (frozen) No. 1 grade	" " "	14·25	11·49	2·17	67·38	2·85	1·86
15	Feed Wheat (frozen) No. 2 grade	" " "	13·36	13·96	2·39	64·93	3·29	2·07
	Oat products—							
16	Victor Feed	American Cereal Co., Peterboro, Ont	6·70	7·44	2·78	55·72	22·42	4·94
17	Frozen Oats	Geo. H. Hutton, Experim'l Farm, Lacombe, Alta.	8·42	8·93	5·52	55·27	18·39	3·47
18	Quaker Oat Feed	American Cereal Co., Peterboro, Ont	10·62	8·59	3·06	62·26	12·35	3·12
19	Feed No. 1, Ground oat straw 75 p.c., Flour 25 p.c.	G. G. N. Cooke, North Nation Mills, Que.	7·97	7·19	1·43	56·81	23·75	2·85
20	Feed No. 2, Ground oat straw	" " "	7·27	5·33	2·21	46·16	33·34	5·69
21	Eureka Feed	The Ogilvie Flour Mills Co.	11·03	10·25	4·05	63·59	8·07	3·61
	Miscellaneous Feeding Stuffs—							
22	Molasses	Dominion Molasses Co., Halifax, N.S.	23·42	1·44	. .	61·18	. . . . .	6·12
23	Molasket Feed	F. A. Dixon, Sackville, N.B.	16·18	2·56	·37	66·81	6·68	7·40
24	National Molasses Stock Food	Wallaceburg Sugar Co., Wallaceburg, Ont.	18·72	9·81	·66	54·92	9·52	6·37
25	Paddy Rice	Blacking & Mercantile Co., Amherst, N.S.	11·66	6·69	2·20	61·20	11·63	6·62
26	Linseed or Oil Meal	Midland Linseed Co., Minn.	. . .	31·75	9·91	. .	. . . . .	. . . . .
27	Linseed Meal	The Sherwin-Williams Co., Montreal	6·84	32·43	16·56	31·84	7·16	5·17
28	Distillery Slop	J. A. Gaulin, Mastaï, Que.	95·41	1·23	·16	. . . . .	. . . . .	. . . . .
29	Ground Feed from Flax Screenings	J. G. King & Co., Port Arthur, Ont.	7·39	13·88	11·71	45·29	15·30	6·43
30	Flax Refuse (before grinding)	" " "	5·54	9·05	5·23	46·13	25·04	9·00
31	Cotton Seed Meal. 1907	Joseph Ward & Co., Montreal, Que.	9·88	36·69	6·82	27·99	12·17	6·45
32	" " 1908	Lefebvre & Mahon, Howick Station, Que.	7·73	38·87	10·41	26·84	9·64	6·51
33	Algoma Feed	F. E. Came, Sault au Recollet, Que.	8·27	13·25	6·98	57·59	9·58	5·23

CORN PRODUCTS.

No. 1. *Corn bran*, from distillery at Corbyville.—This feed is composed essentially of the thin husk or external skin layer of the corn grain, and which is removed in the preparation of the grain for distillery purposes. Though not a high class feeding stuff, by reason of its somewhat low protein-content and comparatively large amount

of fibre, it would be well worth the price at which it is quoted, $5 per ton. For its profitable use, however, it should be fed in conjunction with a more concentrated feed, in order that the requisite amount of protein for milk production, &c., be supplied.

Hitherto we have found samples of corn bran from the distillery inferior to that from the starch works. This sample, however, as regards protein, is very similar to that from starch manufacture, though not so satisfactory with respect to its fat and fibre content.

No. 2. *Corn meal,* stated to be manufactured by Maynes and Riley, Limited, St. John, N.B., and quoted at $25 per ton. A doubt had been expressed as to the genuineness of this meal, but save that its percentage of protein is below the average, nothing unusual or abnormal was noticed. We have found the average protein-content of corn meal to be between 9 and 10 per cent.

No. 3. *'Kiln-dried' Corn meal.*—This was apparently imported from the United States, and was forwarded with a request for information as to its value, compared with that of corn meal ordinarily upon the market. Our analysis shows that it is practically identical in composition with the recorded results for corn meal of good quality.

No. 4. *Gluten Feed,* Brantford Starch Works.—We have in former reports directed attention to a certain confusion of terms in connection with the products of the starch and glucose factories. Good quality 'gluten feed' should contain from 20 per cent to 22 per cent protein, and it is certainly regrettable that a feeding-stuff containing only 14·5 per cent protein should be sold under this name. Such cases, and there are many, serve to emphasize the desirability of having the protein and fat content of these high priced concentrates and by-products guaranteed by the vendor or manufacturer. Under such an arrangement the purchaser would be enabled to intelligently judge of the relative feeding value of any feeding-stuff, apart from its name or appearance.

No. 5. *Gluten Feed,* Edwardsburg Starch Company.—It is only necessary to say that this sample conforms in all respects with the standard recognized for gluten feed of good quality.

No. 6. *Jersey Brand Gluten Meal.* The St. Lawrence Starch Company.—According to the commonly accepted nomenclature, this feeding stuff is incorrectly named. Gluten meal properly so called contains between 30 per cent and 35 per cent protein; this sample possesses but 14·94 per cent.

No. 7. *Corn Oil Cake Meal.* St. Lawrence Starch Company.—Though not so high in protein as gluten meal, the oil cake is richer in fat. This sample is of good average quality.

Nos. 8, 9, 10 and 11. Gluten Feed, Gluten Meal, Corn bran, Corn Oil Cake. These four samples may be considered as representative products of the Edwardsburg Starch Company, and their approximate relative feeding value is easily obtainable from a comparison of their data for protein and fat. They constitute a very satisfactory series of feeds, conforming in all particulars to the standards generally recognized for the products of the starch factory.

WHEAT PRODUCTS.

No. 12. *Bran,* forwarded by John Crawford, Esq., M.P., and stated to be representative of the bran sold by Wilson and Company, Arden, Manitoba. This bran is of inferior quality, the analysis showing that it is too low in protein and too high in fibre. On inspection the sample was found to contain kernels of oats and barley and a very considerable amount of oat hulls and broken straw. Undoubtedly the high fibre content is due to the presence of the hulls and straw.

A number of genuine brans from Canadian mills analysed by us a few years ago afforded the following data :—

Average Composition of Canadian Bran.

Moisture	11·07
Protein	14·52
Fat	4·37
Carbohydrates	54·19
Fibre	10·14
Ash	5·71
	100·00

It is obvious from these figures that the bran under consideration is not of first quality.

Nos. 13, 14 and 15. *Frosted Wheat.*—Elsewhere in this report (page 137) the nature and composition of frosted wheat has been fully discussed. It may therefore suffice to say here that its high protein-content gives it considerable value as a feeding stuff. Practical feeding trials have emphasized the desirability of finely grinding this wheat and using it in conjunction with some more bulky feed, as bran, shorts or ground oats.

OAT PRODUCTS.

No. 16. *Victor Feed.* Manufactured by the American Cereal Company, Peterborough.—This is a corn and oat product, containing a considerable quantity of offal. It is distinctly a low-grade feed, as made evident alike from its analysis and examination. The percentage of protein is very small, while there is a high fibre-content. The price as quoted by our correspondent—$1.60 per cwt—is excessive.

No. 17. *Frozen oats.*—The feeding value of oats that have been caught by the frost while still immature is evidently much below that of normally ripened oats. This is due chiefly to the former possessing a smaller proportion of kernel and a larger amount of hull. The sample under discussion was received from northern Alberta, in which district (as in many others) a considerable acreage of the oats, last season, were frozen while still green. No doubt the stage of development of the oat when frozen would determine very largely its value; hence, it must not be assumed, that the analysis here presented necessarily indicates the feeding value of all oats that have been touched by frost.

For comparison we append an analysis of well matured Banner oats as grown at Ottawa.

Composition of Frozen and Matured Oats.

—	Frozen Oats.	Banner Oats (ripened).
	p.c.	p.c.
Kernels	53·65	71·92
Hulls	46·35	28·08
	100·00	100·00
Moisture	8·42	12·74
Protein	8·93	11·22
Fat	5·52	4·82
Carbohydrates	55·27	58·84
Fibre	18·39	9·47
Ash	3·47	2·91
	100·00	100·00

The significant feature in the foregoing comparison, from the feeding standpoint, is that in the well ripened oats there is almost twenty per cent more kernel than in the frozen sample. It is this fact which is accountable for the reduced protein-content, and the very materially increased proportion of fibre in the frozen grain.

No. 18. *Quaker Oats Feed,* American Cereal Company, Peterboro.—This is a corn and oat feed of the same type as the 'Victor' (No. 16). It is somewhat better than the Victor, as it contains a higher percentage of protein and very much less fibre; but it is not by any means a high class feed, such as it would be necessary to use in order to bring up the proportion of protein in the ration.

Nos. 19 and 20. *Straw and Flour Mixtures.*—The high price of feeding stuffs during the past winter brought on to the market many inferior feeds, but it must be pointed out that Nos. 19 and 20, which are of extremely low feeding value, were not offered for sale, but merely prepared for home use. The farmer requested information as to the nutritive qualities and relative worth. No. 19 is ground oat straw 75 per cent and low grade flour 25 per cent. From its analysis we judge it to have a feeding value approximately equal to that of the Victor feed, already reported. No. 20 affords interesting data, since this sample is entirely prepared by grinding oat straw.

No. 21. *Eureka Feed.* Ogilvie Flour Mills Company.—This is apparently a by-product from the making of oatmeal, and is of very fair quality for feeds of this class. The comparatively low percentage of fibre shows that it does not contain an excessive amount of hull. It does not of course rank with the 'concentrates' of high protein content.

MISCELLANEOUS FEEDING STUFFS.

No. 22. *Molasses,* obtained from the Dominion Molasses Company, Halifax, N.S. Quoted at 22 cents per gallon f.o.b. Ottawa. This feed is to be valued simply from its sugar-content. It is true that it contains 1·44 per cent recorded as crude protein, but further analysis would probably show that even this small amount is not altogether true protein and consequently of little feeding value.

The total amount of sugar is 61·18 per cent, of which 29·99 per cent is cane sugar and 31·19 per cent is dextrose or invert sugar.

Five samples of molasses were forwarded by General Laurie of Oakfield, N.S., who uses large quantities annually of this material, together with linseed meal and cut hay, for fattening steers. Sample No. 15 is that upon which the consignment was purchased in Halifax; samples 1, 2, 3 and 4 were taken from different casks, at random from the carload.

ANALYSIS OF MOLASSES.

	Dry Matter.	Sugar calculated as cane sugar.
	p.c.	p.c.
No. 1	72·40	67·82
No. 2	70·55	60·55
No. 3	60·50	54·05
No. 4	60·36	46·96
No. 15	72·56	62·96

The feeding values of these samples, we may assume, is proportionate to their sugar-content.

In a by-product of this nature a certain degree of variation may be expected even between barrels in the same consignment. No. 4, seems to be the only sample that might be considered as at all seriously below the standard, and it is notable that it is the only one with an acid reaction.

The use of sugar, as in molasses and molasses feeds, undoubtedly enhances the nutritive value of the ration, for practical experience has shown that in addition to its function as a heat producer in the system, sugar may profitably be employed within reasonable limits, as a fattening agent. Apart from their direct food value, these sugar feeds are stated to act beneficially in increasing the appetite, stimulating the digestion and in keeping the animal in a thrifty condition.

No. 23. *Molasket Feed.*—This feeding stuff imported from Demerara, British Guiana, is prepared from crude molassses and peat. The latter acts as a preservative, absorbent of, or vehicle for the molasses, and does not add anything of nutritive value to the compound, though it does serve to neutralize or counteract the tendency to 'looseness' noticed when molasses alone is fed. This combination was first tried, we believe, in Austria some ten or twelve years ago, and has since become popular in Germany and other European countries. By this means large quantities of the refuse molasses from beet and cane sugar manufacture have been put to profitable use.

Molasket feed is a substance which must be considered simply from the standpoint of its sugar content. Of its total sugar, 56·89 per cent, there is 34·08 per cent in the form of cane sugar, and 22·81 per cent as dextrose or invert sugar. It would be of no value for furnishing protein, and its use would of course necessitate the employment of some more highly nitrogenous fodder in the ration.

No. 24. *National Molasses Stock Food.*—Prepared by Wallaceburg Starch Company, Wallaceburg, Ont. It is evidently exhausted beet pulp to which molasses has been added. There is a certain small amount of corn present, but this may be accidental.

The total sugars amount to 20·2 per cent, of which 18·72 per cent is cane sugar and 1·48 per cent dextrose or invert sugar.

No. 25. *Paddy Rice.*—It is under this name that the whole grain or 'rice in hull' is imported from Demerara. The very low percentage of protein makes this feed of very little value for supplementing the home grown fodders, and certainly a very poor material compared with bran and many others of the more nutritive feeds on the market. We have further to notice, that the percentage of fat is quite low, while the amount of fibre, due to the presence of the rice hulls, is considerable. An inspection of the sample reveals a considerable amount of loose hulls, weed seeds and other refuse. These features give further evidence of the very limited feeding qualities of this feed. It is certainly not worth the price quoted, $33 per ton.

Several by-products of rice have been reported on in previous years, and one or two of these analyses are here given for comparison.

ANALYSES OF RICE AND RICE PRODUCTS.

Name.	Particulars.	Moisture.	Protein.	Fat.	Carbohydrates.	Fibre.	Ash.
		p.c.	p.c.	p.c.	p.c.	p.c.	p.c.
Rice Feed	Mount Royal Milling Co. Côte St. Paul, Que.	8·39	12·31	12·39	47·51	11·11	8·29
Rice Meal ...	Victoria, B.C.	....	11·34	12·75	50·31	6·95	7·18
" ..	Brackman Ker Milling Co. Victoria, B.C.	11·47	14·37	16·93	....	....	9·02
" ...	B.C. Rice Milling Co.......	9·06	12·25	15·73	50·01	5·83	7·12
Paddy Rice...	Blacking Mercantile Co. Amherst, N.S.	11·66	6·69	2·20	61·20	11·63	6·62

These results afford proof of the excellent character of rice meal, a product rich in both protein and fat. It has been used with good effect for dairy cows and pigs.

Rice feed apparently contains more hulls and offal than rice meal, and consequently possesses more fibre. The hull of rice is particularly poor in feeding qualities, and it is this fact which causes the paddy rice here reported upon to be so inferior to those hitherto examined.

No. 26. *Linseed Meal.*—Branded 'Midland Linseed Co., Minn.,' and guaranteed to contain protein 32·5 per cent to 37·5 per cent and fat 5 per cent to 8·5 per cent.

Linseed or oil meal is a highly concentrated feeding stuff, presenting in readily digestible form large amounts of protein and fat. It cannot of course be used exclusively for the grain ration, but can be employed profitably, when fed judiciously, to increase the quantity of protein and fat in the food, both for milk and beef production.

It will be of interest to tabulate side by side the percentages of protein and fat of the present analysis with those from linseed or oil meals manufactured in Canada and recently examined in the Farm laboratories.

PROTEIN AND FAT IN LINSEED MEALS.

Name.	Particulars.	Protein.	Fat.
		p. c.	p. c.
Linseed or oil cake	Dom. Linseed Oil Co. Ltd	29·56	10·84
Oil cake meal	" "	27·06	13·75
Linseed or oil cake	Canada Linseed Oil Mills	32·12	6·41
Oil cake meal	" "	31·62	9·98
Linseed or oil meal	Midland Linseed Co. Minn. U.S.A.	31·75	9·91
" "	Sherwin Williams Co	32·43	16·56

No. 27. *Linseed Meal.*—Forwarded by Dr. W. Grignon, St. Adèle, Que., and stated to be from the works of the Sherwin-Williams Company, Montreal. An excellent sample, of good average protein content and particularly rich in oil.

No. 28. *Distillery Slop.*—This fluid refuse contains only 4·59 per cent dry matter (partly in suspension and partly in solution), and consequently cannot be regarded as a material of high feeding value. It is important, however, to note that this dry matter is very rich, practically one-fourth being protein. Hence, the nutritive qualities of the 'slop' are somewhat greater than might be deduced merely from the knowledge of its solid content.

It has been used to advantage both for dairy cattle and steer feeding, in the neighbourhoods of distilleries, but its very nature precludes the possibility of economically using it when it has to be transported any great distance.

No. 29. *Ground Feed from Flax Screenings.*—This material sent by Joseph G. King & Co., lessees of the Canadian Pacific Railway elevator, Port Arthur, is stated to be prepared almost entirely from the screenings from flax. Though the fibre-content is somewhat high, the notable percentages of protein and fat give this feed a rank among the better class of feeding stuffs.

No. 30. *Flax Refuse or Screenings.*—This as received represented the screenings from flax seed and the material used after grinding, as the basis for the feed already discussed (No. 26). It contained a considerable amount of flax balls or seed-capsules, dried flax leaves and dead or immature flax seeds.

This must be regarded as a distinctly low grade material, for the protein-content is not equal to that in the better class of concentrates. Further, the percentage of fibre is excessive. Though the quantity of fat is fairly satisfactory, it is not in itself sufficient to enhance their feeding value to any considerable degree

No. 31. *Cotton Seed Meal.*—This was purchased from Joseph Ward & Co., Montreal, at $32.50 per ton.

No. 32. *Cotton Seed Meal.*—Obtained from Lefebvre and Mahon, Howick Station, Que. Price $32 per ton f.o.b. Howick.

Though the differences between these two meals are not so marked as many of those observed in previous examinations, the analytical data certainly point to No. 29 as the better feeding-stuff. Its percentages of protein and fat are higher, and at the same time it contains much less fibre. The lower value of No. 30 is evidently due to a larger proportion of hull.

Samples of cotton seed meal may show great variation in composition, and reference to our past reports will show a range in protein-content from less than 20 per cent to more than 40 per cent. The importance of purchasing from guaranteed analysis is therefore obvious. It will, however, be useful to know that genuine meals are of a bright yellow colour while inferior grades are much darker and show on closer inspection many fragments of hull intermixed with the fine meal.

No. 33. *Algoma Feed.*—This has evidently been prepared largely from elevator screenings and mill refuse, and was quoted at $25 per ton. Its analysis shows it to contain an amount of protein approximately equal to that in good samples of bran and shorts. Its fat-content is slightly lower than in these universally used feeding stuffs. Mr. F. E. Came, who furnished this sample and who has fed it extensively, reports that the stock find it palatable but that it must be fed in limited quantities on account of its laxative properties.

FERTILIZING MATERIALS.

FISH-SCRAP FROM DOG-FISH REDUCTION WORKS.

This highly nitrogenous material, the product of the Reduction Works at Canso, N.S., and Shippegan, N.B., was first analysed and reported upon in the autumn of 1905, and the results of this examination, together with those obtained in the following year, were given in the Annual Report of the Chemical Division for 1906. Accompanying the data, information was furnished regarding the nature, use and value of this by-product as a fertilizer. Formulæ were also added that would enable farmers to utilize the fish-scrap in the preparation of a 'complete' fertilizer, useful for the various kinds of farm crops.

During 1907 further analyses have been made, the results of which may now be given:—

COMPOSITION OF FISH-SCRAP.

Constituents.	A.	B.	C.	D.
	p. c.	p. c.	p. c.	p. c.
Moisture	9·03	12·15	12·29	18·92
Nitrogen	8·71	8·88	8 84	8·87
Phosphoric acid	3·96	3·77	3·61	3·16
Total mineral matter	10·42	10·27	9·81	
Mineral matter insoluble in acid	1·43	0·32	0·29	
Oil	25·26	22·69	21·67	

A. From Canso Dog-fish Reduction Works, June 4, 1907.

B. and C. Two shipments from Reduction Works at Canso and Shippegan, October 12, 1907.

D. Sent by E. Sweet, Country Harbour, N.S., December 30, 1907, and stated to be from the Canso Works.

In all essential particulars these samples show a strong similarity, giving evidence of a very satisfactory character as regards uniformity in the composition of the output. The percentages of nitrogen and phosphoric acid are in very fair accord with those of samples reported on in 1906, and indicate a high fertilizing value.

By reason of the fact that the quantity of oil present was larger than desirable, the values for nitrogen and phosphoric acid were placed somewhat lower than those for the better organic manures, viz., nitrogen 13 cents per lb. and phosphoric acid 5 cents per lb. At these figures the scrap would be worth between $26 and $27 per ton.

FERTILIZER FROM WHALING STATION.

This refuse material, resulting from the extraction of oil from the flesh and blubber of whales, is similar in character to fish-scrap, its fertilizing value depending chiefly if not entirely on its nitrogen-content.

The sample examined was forwarded by Mr. J. Stephens, Nanaimo, B.C., who states that this scrap is from the output of a whaling station, north of that city, on Vancouver island.

Analysis of Whale-scrap.

	Per cent.
Moisture	3·42
Organic matter	93·93
Ash or mineral matter	2·65
	100·00
Nitrogen	11·52
Phosphoric acid	·82

The data make evident that this is essentially a nitrogenous material, and in this regard it must be considered as possessing a high value. Its percentage of phosphoric acid is almost negligible, and consequently if a 'complete' fertilizer is desired not only some form of potash but also of phosphoric acid must be added.

GRAPE REFUSE FROM WINE FACTORY.

This waste product consists essentially of the skins and seeds of grapes used in the manufacture of wine. From such information as we can gather it has no commercial value, but can be obtained gratis by farmers or others on application at the wine factory. At the request of several fruit growers in the Niagara district, where it has been used of late years to some extent, we have determined its composition.

Two samples were forwarded, collected some weeks apart at the same factory, and their moisture-content on arrival at the laboratory was 54·59 per cent and 66·20 per cent respectively. The samples were mixed and an analysis made, the results being calculated on the basis of 60 per cent water.

ANALYSIS OF GRAPE REFUSE.

	Per cent.
Water	60·00
Organic matter	38·60
Mineral matter or ash	1·40
	100·00

	Per cent.	Per ton. Lbs.
Nitrogen	·77	15·4
Phosphoric acid	·20	4·0
Potash	·36	7·2

The amounts of the fertilizing constituents are by no means large, and consequently the profitable use of this refuse would be confined to districts in the immediate vicinity of wine factories.

Much of its plant food is, of course, in the grape seeds, and this naturally would not become available until they have at least partially decomposed.

It is difficult to say how long such seeds might remain in the soil intact when the crude material is applied to the soil, but it is evident that a previous composting would be advantageous in bringing about a liberation of the fertilizing elements. If wood ashes were used in the compost heap, the resulting material would be the richer in potash, and any acidity developing in the fermentation of the refuse corrected.

WASTE FROM COTTON FACTORY.

As received, this waste was a loose, light fibrous material rather dusty and of a brownish colour. It is from the mills of the Montreal Cotton Mills, Valleyfield, Que., where considerable quantities are produced during the year.

Analysis of Waste.

	Per cent.
Moisture	6·35
Organic matter*	71·61
Mineral matter**	22·04
	100·00
*Containing oil	2·22
**Containing sand, &c.	15·61

Fertilizing constituents—

	Per cent.	Per ton. Lbs.
Nitrogen	1·32	26·4
Phosphoric acid	·45	9·0
Potash	1·52	30·4

While not particularly rich in plant food it is evident that the material would have some fertilizing value provided its constituents could be rendered more readily available by decomposition, as by fermentation with manure, &c. In this connection the following information furnished by our correspondent will prove of interest. He writes: 'This cotton waste has formerly been dumped in an old quarry containing water and left there for several years to decay. This seems to be an expensive and wasteful plan of utilizing it. For some little time I have been using it as a litter in box stalls, and as an absorbent in the gutter behind the cows. It is too dusty to bed milkers with. As an absorbent it is rather slow, but it is capable of taking up and holding a large quantity of liquid manure when used as described and sufficient time is allowed it to act. The resulting manure heats very quickly, if more than a load is left in a loose pile. This rapid and excessive fermentation can, I think, be overcome by putting the manure in small piles, about one-third or one-half load each, or possibly in large piles, and keeping them well tramped and compact. As yet we cannot say how readily this manure may decay in the soil.'

FLUE DEPOSIT AND DUST FROM ELEVATORS.

Several interesting materials occurring in the cleaning of wheat at the elevators at Port Arthur have been examined as to possible fertilizing value.

In a letter received in March, 1907, our correspondents (The British American Elevator Company, Limited) write: 'We send you a sample of a deposit as it occurs in the flues of all the furnaces as a result of running the dust from the 'smut machines' to them. It is deposited in layers about six inches thick, and must be chipped off after closing down. Our dust collectors, as you are no doubt aware, collect the dust from all the machines, cleaners and smutters, and conduct it by air pressure to the furnaces, where it is consumed. The deposit sent only forms when the smut machines are used. The grain is all previously cleaned, so that sand or similar foreign matter can scarcely be present.' This flue deposit as received was an extremely hard, brittle, vitreous material of a bluish-grey colour and of a honeycombed or porous structure. Its analysis afforded the following data:—

Analysis of Flue Deposit.

	Per cent.
Moisture and volatile matter	1·04
Insoluble matter, chiefly silica	65·84
Oxide of iron and alumina	3·70
Lime (Ca O)	2·58
Magnesia (Mg O)	3·68
Potash (K_2O)	8·26
Soda Na_2O	1·30
Phosphoric acid (P_2O_5)	12·43
Undetermined	1·17
	100·00

The essential elements of fertility in this material are potash and phosphoric acid, of which it contains notable quantities. At the values assigned these forms of plant food in commercial fertilizers, one ton of the deposit would be worth about $22.

A consideration of these data shows that it is particularly rich in phosphoric acid, and it therefore became of interest to ascertain if this feature were due to the ash from smut or from that of the general elevator dust. Samples of such 'dusts' were kindly supplied by the above mentioned company and analysed. The tabulated results as follows allow easy comparison:—

COMPOSITION OF 'SMUT DUST' AND OF 'ELEVATOR DUST.'

Constituents.	'Pure Smut dust.'	Ordinary Elevator dust, free from Smut
	p. c.	p. c.
Organic and volatile matter	95·15	87·74
Ash or mineral matter	4·85	12·26
	100·00	100·00
Composition of Ash—		
Insoluble matter, chiefly silica	34·84	64·27
Oxide of iron and alumina	4·33	3·83
Lime (Ca.O)	3·50	4·89
Magnesia (Mg.O)	7·42	3·50
Potash (K_2O)	22·15	14·43
Soda (Na_2O) by difference	7·14	4·00
Phosphoric acid (P_2O_5)	20·62	5·08
	100·00	100·00

Both samples yield an ash rich in potash and phosphoric acid, but that from the smut, which consists essentially of the spores of the hard smut or bunt, is much more valuable, over two-fifths of its weight being made up of these fertilizing elements.

GYPSUM OR LAND PLASTER.

Though not in the strict sense of the term a fertilizer, gypsum or land plaster has a distinct agricultural value, furnishing lime and liberating potash for crop growth from its insoluble compounds in the soil. It may be applied at the rate of 500 pounds per acre, and has been so employed for nearly all classes of farm crops, though specially recommended for turnips, Indian corn, pease and leafy crops in general, as well as for the top dressing of grass lands to encourage the growth of the clovers.

Possibly the most valuable property of this material, from the farmer's and dairyman's point of view, is that of 'fixing' or retaining ammonia. For this reason we advise its use first in the stable and cow barn, rather than its direct application to the soil. If sprinkled in the finely ground state, on the floor, in the stalls and behind the animals it will prevent loss of ammonia from the fermenting urine, rendering the manure more valuable and the atmosphere of the stable or barn sweeter and more wholesome.

Natural deposits of large size occur in Ontario, Nova Scotia and New Brunswick, and certain analyses of samples from thesse provinces will be found in the report of the Chemical Division for 1900. A further sample from Tobique, N.B., sent by a correspondent in Victoriaville, Que., has been examined during the past year, and found to contain 94·12 per cent of sulphate of lime. This is evidently of high quality, being practically free from insoluble rock matter.

DEPOSIT FROM STE. CROIX RIVER, N.B.

This river deposit had attracted the attention of farmers, as a possible fertilizer for their lands, and a request for its analysis was accordingly received. Our correspondent writing from Saint Stephen, N.B., states 'there is a large quantity of this deposit here which could be used with great benefit by the farmers in this vicinity, provided it were beneficial to roots and grass.'

Analysis of Air-dried Deposit.

	Per cent.
Moisture	3·45
Organic and volatile matter	8·86
Insoluble in acid (clay and sand)	74·29
Oxide of iron and alumina	10·41
Lime	·74
Magnesia	1·55
Potash	·70
Phosphoric acid	·25
	100·25
Nitrogen, in organic matter	·23

The percentages of plant food are quite similar to those in ordinary fertile soils. Hence, while the deposit may prove of some value as an amendment for certain classes of soil it cannot be considered as having any great value as a fertilizer. Save probably for very poor lands, and those in the immediate neighbourhood of the deposit, it is doubtful if it could be used profitably.

LIME-KILN ASHES.

From time to time inquiries are received regarding the value of this material as a fertilizer. We have found it extremely variable in composition; in some few instances samples have been analysed that contained more than two per cent potash.

but in the larger number of cases the potash content has been in the neighbourhood of one per cent, and, occasionally, little more than traces. The phosphoric acid is usually between five per cent and one per cent. The relative amounts of caustic (burnt) lime and (unburnt) limestone vary considerably. As lime can frequently be used to advantage as an amendment, the proportion of the former that is present will frequently very largely determine the price that may be given for the ashes. The unburnt limestone and any sand or other rock matter are of course valueless. A sample forwarded by Mr. D. Madore, Montreal, last year afforded on analysis the following data:—

Analysis of Lime-kiln Ashes.

	Per cent.
Potash	1·25
Phosphoric acid	·43
Lime	62·09
Insoluble matter (sand, &c.)	13·05

We should consider this a sample of average composition.

MARL.

Two samples of this naturally occurring amendment, analysed during the past year, may be reported, as they are from localities not hitherto recorded in this connection:—

ANALYSIS OF MARL.

Constituents.	No. 1. — Lascelles, Que.	No. 2. — White Bay, Newfoundland
	p. c.	p. c.
Moisture	2·67	2·31
Carbonate of lime	87·04	82·81
Insoluble rock matter	3·52	9·46
Phosphoric acid	0·02	0·14
Sulphates	Traces.	Traces.
Undetermined (organic matter, magnesia, &c.)	6·75	5·28
	100·00	100·00

No. 1, from Lascelles (Gatineau Valley), Wright County, Que., is of excellent quality, containing only 3·5 per cent inert matter.

No. 2, from White Bay, on the northeast coast of Newfoundland, where large quantities are stated to exist. It is of very good quality, but not quite equal to No. 1.

Marl is a very useful amendment for all soils deficient in lime, for correcting sourness in poorly drained soils, for peaty and muck soils as well as for improvement of heavy clays.

CALCAREOUS DEPOSIT.

In the report of this Division for 1904, analyses are given of samples of a deposit —essentially carbonate of lime—occurring in the semi-arid belt of British Columbia, and evidently arising by deposition from waters highly charged with lime. This material is extremely hard, semi-crystalline, and with a more or less honey-comb structure. A further sample, received from Mr. George E. Winkler, Penticton, Okanagan district, B.C., has been analysed, and found to have the following composition:—

Analysis of Calcareous Deposit.

	Per cent.
Carbonate of lime	72·99
Insoluble rock matter	18·74
Oxide of iron and alumina	3·70
Phosphoric acid	·15
Organic matter, &c. (by difference)	4·42
	100·00

This sample is not quite equal in quality to the larger number of those examined in 1904, but might be used to advantage if first crushed or burnt, for low-lying and muck soils, as well as for strong clays and all soils naturally deficient in lime. It is scarcely necessary to add that the amount of phosphoric acid is so small that the deposit has no value from this standpoint.

GAS LIME.

Our examination of a sample forwarded by a correspondent at Sackville, N.B., and produced at the gas works, St. John, N.B., afforded the following data:—

Analysis of Gas Lime.

	Per cent.
Moisture	5·61
Insoluble residue (clay and sand)	1·07
Oxide of iron and alumina	1·17
Lime	47·27
Magnesia	1·03

These figures, though not representing the entire composition of the gas lime, are sufficient to show that the sample is free from extraneous matter. The percentage of moisture is considerably less than that usually found in this by-product, and hence there is present a larger proportion of lime compounds than is commonly the case.

The lime exists partly as slaked lime, partly as carbonate and partly as sulphide, sulphate and other sulphur compounds. Naturally the composition will vary somewhat from day to day as it comes from the gas works, affecting not only the total sulphur present but also the manner in which it is combined.

As an amendment, exposure to the air is desirable before mixing the gas lime with the soil. This will convert the injurious sulphur compounds into forms harmless to vegetation.

INSECTICIDES AND FUNGICIDES.

FORMALDEHYDE.

This chemical is now used in such large quantities in Manitoba and the Northwest generally in the treatment of grain for the prevention of smut, that it seems desirable from time to time to examine the brands upon the market as to purity and strength. This work was begun in 1903, and again taken up in 1905, and it is gratifying to be able to record, that in so far as the samples examined may represent the various formaldehydes sold in Canada, there has been no wilful adulteration or material falling off in strength. The results of the analyses made in 1907 range from 36·24 to 37·79 per cent formaldehyde by weight, figures which are in very fair accord with those of previous years.

THE EFFECT OF EXPOSURE ON SOLUTIONS OF FORMALDEHYDE.

The use of formaldehyde for the prevention of smut in wheat has markedly increased during the past few years in the Canadian Northwest. Formaldehyde is

rapidly replacing bluestone in the treatment of wheat and other grains, not, perhaps, by reason of its being cheaper or more effective, but more probably because its solution is more easily and readily prepared: simple dilution being all that is necessary. In this connection it may be remarked that, not only is the area sown to grain increasing annually, but the proportion of treated grain to the whole amount sown constantly increases. It was said recently by an agricultural authority in Saskatchewan, that less than one-tenth of the grain now sown went into the ground untreated.

Among other investigations with formaldehyde during the past year, we have made some experiments towards ascertaining the effects of exposure on solutions of various strengths. This is a matter upon which many and conflicting statements have appeared in the agricultural press, and it seemed desirable to learn by actual experiment to what degree the formaldehyde solution might be so affected.

The trials were made with solutions of two strengths: one, the solution of formaldehyde as bought, which is commonly known and sold as a 40 per cent solution, and the second, a solution such as is used for the treatment of wheat, namely, 4½ fluid ounces of the solution of formaldehyde per 10 gallons of water.

The plan was to expose these solutions in (1) an uncorked bottle, and (2) in an open dish, making all the necessary estimations before and after the period of exposure.

EFFECT OF EXPOSURE OF FORMALDEHYDE SOLUTIONS.

EXPERIMENT 1.—EXPOSURE 5 DAYS AT 65°-70° F.

Formaldehyde.	A.		B.
	In uncorked bottle.	In open dish.	In open dish.
	p. c.	p. c.	p. c.
Strength of original solution	36·6	36·6	0·125
" residual "	37·1	47·6	0·173
	Grams.	Grams.	Grams.
Amount present in original solution	73·22	73·22	0·250
" residual "	72·72	60·97	0·239
Loss of Formaldehyde	0·50	12·25	0·011

The original volume in each of the three trials was 200 c c; the residual volumes were 196 c c, 128 c c, and 128 c c respectively.

EXPERIMENT 2.—EXPOSURE 17 DAYS AT 65°-70° F.

Formaldehyde.	C.		D.	
	In uncorked bottle.	In open dish.	In uncorked bottle.	In open dish.
	p. c.	p. c.	p. c.	p. c.
Strength of original solution	37·54	37·51	0·123	0·123
" residual "	38·00	56·73	0·124	0·147
	Grams.	Grams.	Grams.	Grams.
Amount present in original solution	101·00	101·17	65·10	62·25
" residual "	100·47	84·90	64·31	56·79
Loss of Formaldehyde	0·53	16·87	0·79	5·46
Weight of original solution	269·05	269·50	529·30	506·1
" residual "	264·40	149·65	518·63	386·3

In the concentrated solutions (A and C) the formaldehyde exposed in the open dish polymerized and became in part solidified. The formation of the polymer (paraldehyde) probably affected more or less seriously the efficiency of the solution for the purpose of grain treatment.

It will be noticed in the first place, that all the solutions increased in strength by exposure, the stronger the original solution the greater the increase. Secondly, this increase is accompanied in every case by loss of formaldehyde, the loss being proportionate to the strength of the solution. The fact that there is an increase in strength and at the same time a loss of formaldehyde is readily explained by the data which show that the amount of water, or more correctly of methyl alcohol, evaporated from the solution is greater than that of the formaldehyde, hence the concentration.

The case of D (diluted solution) may be considered somewhat in detail. By calculation it will be found that the 17 days' exposure increased its strength from 4½ fluid ounces per 10 gallons (3 parts per 1000) to (approximately) 5½ ounces (3·6 parts per 1000) per 10 gallons. Such a solution, as we have pointed out, might prove too strong for weak germs, and therefore do undue injury. We should therefore counsel making up the solution when required. Further, the concentrated solution as bought should be kept in a corked or stoppered bottle and stored in a cool dark place.

THE ACTION OF CERTAIN SMUT PREVENTIVES ON THE VITALITY OF WHEAT.

From the fact that comparatively large quantities of frozen wheat would be used as seed in certain sections of the Northwest this spring, it was thought desirable to ascertain the extent to which such wheat (which is known to have an impaired vitality) is affected by the various treatments to which it may be subjected for the destruction of smut. However, in order that data might be obtained that would be useful in the treatment of sound, thoroughly ripened wheat, as well as of that more or less injured by frost, the complete series of the grades of the Manitoba inspection of 1907 was selected for this investigation. Indications of frost (or, at all events, of unfavourable weather conditions) are first apparent in No. 3 Northern; grades lower than No. 3, and more especially No. 6 and 'Feed,' show a larger proportion of frosted and shrivelled grain. The tests about to be recorded were commenced at the latter end of March.

Strength of Solutions Used.

Formaldehyde.—Two strengths were employed: the stronger, 1 lb. to 32 gallons; the weaker, 1 lb. to 48 gallons. It is generally admitted that 1 lb. to 32 gallons (3 parts in 1000) is sufficiently strong to kill the smut spores, and it is apparently the strength more commonly advocated and used.

With regard to the weaker solution employed, 1 lb. to 48 gallons (2 parts in 1000), it must be conceded that evidence of a definite character as to its effects on smut spores is wanting. It seemed very desirable, however, to employ for wheat with an impaired vitality a weaker solution than that ordinarily used, and accordingly the solution noted (2 parts in 1000) was decided upon, assuming that in all probability any further dilution might render the solution ineffective in the destruction of smut.

Bluestone.—Two strengths were employed: 1 lb. in 8 gallons, and 1 lb. in 12 gallons. The argument used in the preceding paragraph applies equally to the selection of the two bluestone solutions as to those of formaldehyde.

Treatment and Method of Testing.

The wheat was immersed for five minutes, care being taken to see that every kernel was completely moistened with the solution. The grain was then taken out and put on glass plates, on which it was allowed to dry in a layer not exceeding half an inch in thickness.

Two sowings were made, the first at the expiration of twenty-four hours; the second, three days after treatment, in order to learn what effect delay in sowing the treated wheat might have on vitality.

The grain was sown in soil, using ordinary greenhouse flats, and 200 kernels employed for each test. Countings of the seedlings were made at the end of ten days and fourteen days. Final countings only are given in the subjoined table.

VITALITY of Wheat after Treatment with Solution of Formaldehyde and Bluestone.

—	Untreated.	Formaldehyde, 1 lb. in 32 galls.		Formaldehyde, 1 lb. in 48 galls.		Bluestone, 1 lb. in 8 galls.		Bluestone, 1 lb. in 12 galls.	
		Sown 24 hours after treatment.	Sown 3 days after treatment.	Sown 24 hours after treatment.	Sown 3 days after treatment.	Sown 24 hours after treatment.	Sown 3 days after treatment.	Sown 24 hours after treatment.	Sown 3 days after treatment.
	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.e.
No. 1 Hard.......	98	84	78	93	89	54	51	76	56
No. 1 Northern..........	97	75	78	91	86	57	63	74	66
No. 2 Northern..........	95	78	75	80	88	52	51	69	70
No. 3 Northern..........	93	62	56	69	73	46	33	50	47
Commercial Grade No. 4.	96	58	56	71	71	48	41	44	52
Commercial Grade No. 5.	88	46	40	50	66	17	35	48	49
Commercial Grade No. 6.	89	51	61	73	64	33	28	35	52
'Feed'................	62	37	29	45	47	37	30	54	31

Untreated Wheat.

No very appreciable falling off in the vitality is to be noticed until grade No. 5 is reached, where a decided, though not exceedingly large, reduction is to be observed. Nos. 5 and 6 are practically equal, but 'Feed' is markedly lower, with a vitality in the neighbourhood of 60 per cent and a larger proportion of weak plants than the higher grades.

As regards rapidity of germination—as determined by the appearance of the seedling—we found more or less constant falling off from the first to the last of the series, and this was more especially noticeable in the grades below No. 3. Our observations have led us to conclude that the greater the retardation of germination, whether in treated or untreated grain, the larger will be the number of weak plants and, usually, the lower will be the final percentage of vitality.

Treated Wheat.

1. It will be observed, first, that in every instance the action of the smut preventive has been to lower the percentage of vitality. In the majority of instances this effect has been of a very marked character.

2. That the stronger the solution, the greater the injury; this is true alike for formaldehyde and bluestone solutions. In the table of results certain exceptions will be found, but they are, it will be noticed, chiefly among the lower grades.

3. That the degree of injury from the preventive solutions is, as a rule, decidedly greater in the lower grades (which contain more or less frosted wheat) than in the first members of the series which, as already noted, are free from frosted kernels.

Wheat Sown Twenty-four Hours after Treatment.

4. That with the exception of 'Feed' (which shows irregularities in many of the tests) all the grades have suffered more from the bluestone than from the formaldehyde treatment.

5. That, comparing the results from formaldehyde solution, 1 lb. in 32 gallons, with those from bluestone, 1 lb in 8 gallons, there is a difference of vitality ranging from 10 per cent to 30 per cent in favour of the formaldehyde solution.

6. That the treatment with the more dilute formaldehyde solution, 1 lb. in 48 gallons, is less severe than that with the more dilute bluestone solution, 1 lb. in 12 gallons.

7. That the stronger formaldehyde solution, 1 lb. in 32 gallons, affects the vitality of the wheat to a less degree than the more dilute bluestone solution.

Wheat Sown Three Days after Treatment.

8. That a delay of three days in sowing the grain treated with the stronger solutions, both of formaldehyde and bluestone, lowers the percentage of vitality. Injury from this cause is not so apparent in the wheats treated with the weaker solution.

9. That delay in sowing not only reduces the percentage of vitality, but results in increasing the proportion of weak and slender plants, indicating an injurious 'after effect' from both formaldehyde and bluestone solutions.

Retardation of germination always results from treatment, the length of time before the appearance of the seedling being proportionate partly to the strength of the solution used and partly to the period elapsing between treating and sowing the grain. The degree of this retardation in germinating is a fair measure of the final effect on the vitality and vigour of the wheat.

10. As in the case of the wheat sown twenty-four hours after treatment, the grain treated with the stronger formaldehyde solution has a higher vitality than that from either of the bluestone solutions, and we further observe the results from the weaker formaldehyde solution show much less injury to vitality than those from the weaker bluestone solution.

A survey of the whole results shows that the solution causing most injury to the wheat germ was the stronger bluestone, 1 lb. in 8 gallons, and following in the order of their effect came the weaker bluestone, 1 lb. in 12 gallons, the stronger formaldehyde, 1 lb. in 32 gallons, with the weaker formaldehyde, 1 lb. in 48 gallons, as the least injurious.

In view of this work, it seems advisable that in the treatment of grain the vitality of which may have been impaired by frost, a solution of formaldehyde not stronger than 1 lb. in 48 gallons should be used, and that the seed should be sown with as little delay as possible after treatment.

Comparing these results with those of a similar character obtained in previous years, it would seem that the wheat of the crop of 1907—even that of the highest grades—is somewhat more susceptible than usual to the action of these smut preventives. If the present data may be considered as furnishing evidence in this direction, the explanation may, perhaps, be found in the unfavourable weather conditions which prevailed last season in the Northwest, and possibly prevented the thorough maturing of much of the grain.

LIME-SULPHUR WASHES.

The use of these 'washes,' originally employed for the destruction of the San José scale, has in recent years been greatly extended, it having been found that these sulphur compounds possess a more or less general value against both insects and fungi. At first recommended simply and solely as a winter spray on dormant wood, they are now, in a more diluted form, coming into favour for summer use.

It is not our intention to discuss the various formulæ that have been put forward for the preparation of these washes; their name is legion, and a consideration of their characteristics and relative merits would require more space than is now available.

It may, however, be pointed out:—

First. That of the many sulphur compounds that may be formed, sulphates, sulphites, thiosulphates, sulphides and polysulphides, the value or efficiency of the spray will chiefly depend upon the amount of sulphur in the form of sulphides.

Second. That as soon as all the sulphur is brought into solution boiling should cease—continued boiling tends to increase the proportion of sulphur compounds of less value than the sulphides. According to laboratory experiments, thirty minutes is a long enough period to boil the mixture, to ensure solution of the sulphur. As field conditions would not be quite so satisfactory, a longer period for boiling, say one hour, might be adopted for practical work.

Third. That as regards the amount of sulphur that can be used per barrel (40 gallons), it would seem that from 12 to 25 lbs. represents the limit in the various formulæ proposed. More than the latter amount could scarcely be brought into solution; less than the former quantity would probably yield a spray not sufficiently strong for horticultural use. In this connection we may insert the following formulæ from the Spraying Calendar of the Experimental Farm, remarking that in less than one hour's boiling we had a fluid which contained no free sulphur:—

Lime-Sulphur Wash, for San José Scale and Fungus Diseases.

Lime..	12 lbs.
Sulphur, powdered..	12 lbs.
Water to make..	40 gallons.

Slake the lime with only enough water to do it thoroughly. Add the sulphur by dusting it over the lime while slaking; stir well and boil for at least an hour, adding only so much hot water as is necessary for easy stirring. When thoroughly cooked, strain through sacking, and apply hot.

This spray would contain approximately four and four-fifth ounces of dissolved sulphur per gallon.

In this connection it will be of great interest to insert the results of our analyses of two samples of ready-made lime-sulphur washes, manufactured by the Niagara Sprayer Company, Middleport, N.Y. These samples were forwarded to the Horticulturist for trial on the Experimental Farm, and require dilution before use.

	Soluble sulphur. Per cent.	Soluble lime. Per cent.
No. 1—Niagara Brand Lime and Sulphur Solution.. ..	21·60	11·61
No. 2—Improved Niagara Brand Lime and Sulphur Solution (clear solution)..	18·75	9·63
No. 2—Niagara Brand Lime and Sulphur Solution (semi-solid part)..	19·54	7·85

No. 1 is an orange-red solution, perfectly clear and free from sediment. It contains approximately 2 lbs. 3⅓ ounces of sulphur per gallon.

No. 2 consists of a deep orange fluid in which there is present dark greenish crystals, forming a semi-solid mass. Analyses were made of both the solution and the crystals. No free sulphur was found, and on sufficient dilution of the preparation all the sulphur compounds went into solution.

Fourth. That an excess of lime may be an advantage from the insecticidal point of view, but there is no necessity to use more lime than sulphur in order that the latter may be all brought into solution.

Fifth. That the presence of salt does not materially affect the composition of the resulting spray, though it may increase its adhesive power in use.

In concluding these notes on our work on these washes (a work which is still in progress) the writer wishes to acknowledge that he has consulted and freely drawn

upon the matter presented in the excellent bulletin written by Mr. J. K. Haywood (Bureau of Chemistry, United States Department of Agriculture, Bulletin No. 101). Many of our experiments were of a similar character to those of Mr. Haywood, and it was therefore very satisfactory to find that his results and ours were in such close accord.

V 1 and V 2 fluids.

These fluids, for which great claims are made both as insecticides and fungicides, have recently been extensively advertised in Canada. They are prepared by Wm. Cooper and Nephews, Berkhamsted, England, who have established a Canadian agency in Toronto. V 1 is recommended for winter use, V 2 is to be employed as a summer spray. In each instance simple dilution with water is all that is necessary in the preparation of the spray. They are essentially carbolic washes or sprays, V 2 differing chiefly from V 1 in containing less crude carbolic acid and in possessing 'soluble paraffin,' making it essentially a kerosene emulsion.

Series I.—Samples received from England afforded on analysis the following data:—

Approximate Composition of V 1 and V 2 Fluids.

Constituents.	V 1	V 2
	p.c.	p.c.
Water	20·0	18·0
Crude carbolic acid (phenols)	50·0	29·0
Petroleum (non-saponifiable) oils	.....	20·0
Saponifiable oils	20·0	25·0
Caustic soda	10·0	8·0
	100·00	100·00

Series 2.—A few weeks after the preceding analyses had been made, the Horticulturist, who is making a practical test with these fluids, requested an examination of a further consignment, received through the Canadian agency. The results differ but slightly from the foregoing data.

Approximate Composition of V 1 and V 2 Fluids.

(Received from the Canadian Agency.)

Constituents.	V 1	V 2
	p.c.	p.c.
Water	20·0	17·0
Crude carbolic acid (phenols)	50·0	26·0
Petroleum (non-saponifiable) oils	....	24·0
Saponifiable oils	20·0	26·0
Caustic soda	10·0	7·0
	100·00	100·00

V 1 Fluid, for winter spraying and use on dormant wood.—A reddish-brown fluid, of the consistency of syrup or glycerine, with a strong smell of carbolic acid. There is no separation into layers nor any deposit on standing. Strongly alkaline and miscible in all proportions with water, forming a milky, soapy solution. In this fluid the constituents are combined so that we have in a strongly alkaline medium, carbolic

and ordinary soaps to the extent of approximately 80 per cent of the total weight. Search was made for petroleum oils, but none could be detected.

V 2 Fluid, for summer spraying.—A reddish-brown liquid, decidedly thinner than V 1. In Series I. this fluid separated on standing into two layers, the upper one (approximately 13 per cent by volume of the whole) proved to be light petroleum (kerosene) oils. On thoroughly mixing the two layers, the fluid was found to be miscible with water in all proportions, and there was no apparent separation of the petroleum oil on standing. In Series 2 no such separation into layers was observed, the fluid remaining perfectly clear and homogeneous. The diluted fluid has a milky, soapy appearance, similar to that of the diluted V 1.

As trials are now in progress on the Experimental Farm with these fluids, it would be premature to pronounce on their insecticidal and fungicidal value, but it should be added that experience in the United States and England with carbolic washes for insecticidal purposes has been far from satisfactory. We therefore think until such time as reliable testimony regarding the efficiency of these fluids is available, that it would not be well to consider their practical value for orchard use as established.

VAPORITE.

This is an insecticide or deterrent in the form of a powder for soil application. It is manufactured by Strawsons, London and Paris, who state that in contact with moist soil it gives off a vapor that will kill all injurious insects in the soil. 'The gas given off from Vaporite is light and works upwards, so it is obvious that Vaporite must be inserted deep enough (about 5 to 7 inches) in order that the gas which is evolved permeates the whole of the layer of the soil infested with pests.' The rate of application is given at from 2 to 3 cwt. per acre, the quantity varying with the character of the soil, digging in immediately after scattering.

We sumbitted a sample of this insecticide to analysis and find it to consist of approximately 25 per cent to 30 per cent naphthalene oils and 70 per cent to 75 per cent gas lime. On standing in a bottle in a warm room crystals of naphthalene are rapidly formed on the sides of the bottle. The substance possesses a strong smell of napthalene, like moth balls.

At ordinary temperatures there would be a considerable amount of napthalene given off, and this would condense in the soil. This undoubtedly would make the soil an unpleasant habitat for the insects, but its action as an insecticide, unless present in large quantities, seems somewhat doubtful. Unquestionably, its effect to some extent depends on the character of the soil and of the insect to be destroyed, and experience must be gained under varying circumstances before a conclusion is arrived at regarding its practical value. Gas lime, one of the constituents of this material, has long been used for the destruction of larvæ of noxious insects, slugs, centipedes, &c., in the soil.

ANTI-FUNGI.

This material, manufactured by the Anti-Fungi Chemical Company, Binghampton, N.Y., is being sold in the Canadian Northwest for the treatment of grain for the prevention of smut. It is put up in one pound packages, at the price of 25 cents each. It is a light blue crystalline powder. On analysis it was found to have the following composition:—

Analysis of Anti-fungi.

	Per cent.
Sulphate of iron (green vitriol or copperas)	54·57
Sulphate of copper (bluestone)	44·91
Ether extract (apparently menthol)	·52
	100·00

Practically, this is a mixture of 55 per cent copperas and 45 per cent bluestone, to which a small amount of menthol has been added—apparently for the purpose of giving an odour to the material, for it has not been shown that menthol has any value for the destruction of smut spores on grain.

Some years ago we showed that the smut-destroying power of sulphate of iron was very much lower than that of bluestone. It may, therefore, be concluded that a solution of 'Anti-Fungi' would be far less efficacious in killing smut spores than one of equal strength made simply from bluestone.

The price asked for this material is exorbitant and out of all proportion to that of its constituents. If the retail price of bluestone were 10 cents or 12 cents per pound, and that of copperas about one-third of these figures, a very handsome profit would be obtained at half the price asked for it. Menthol (even if virtue were claimed for it as a sporicide) is not, in the quantities here contained, a constituent of any great value. At retail prices the amount present in a one pound package would cost in the neighbourhood of one and one-half cents.

MISCELLANEOUS.

THE FERTILIZING VALUE OF RAIN AND SNOW.

The atmosphere consists chiefly, as is well known, of oxygen and nitrogen, but small quantities of other gases which owe their origin to the vital processes and the decay of animals and plants, to the combustion of fuel and to some extent to the passage of the electric current through the air, are always present. Dust and, in the neighbourhood of cities, soot, are also to be considered as normal constituents of the air. The rain and the snow falling through the atmosphere dissolve these gases and wash out the dust and soot, and thus it is that the air, through the agency of the rain and snow, furnishes annually not inconsiderable amounts of fertilizing material to the soil. The chief element of plant food so supplied is nitrogen, present largely as ammonia, ammonia salts and nitrates, compounds either directly serving for the nourishment of vegetable life or readily convertible in the soil into assimilable forms.

Analyses of rain and snow, covering shorter or longer periods, have been made by agricultural chemists in Europe and many other parts of the world, and from the data so obtained and the precipitation figures the amounts of nitrogen furnished per acre and per annum have been estimated for the several localities in which the examinations were made.*

Our search for analyses of snow and rain in Canada was, however, unsuccessful, and the writer therefore thought that it would prove interesting, especially from the agricultural standpoint, to obtain data as to the nitrogen-content of these forms of precipitation as occurring at Ottawa.

The work was begun in February, 1907, but the necessity for certain preliminary analyses made it desirable to delay the official recording of the results until March 1, from which date for twelve months the data are now presented.

The Central Experimental Farm, on which the collections of rain and snow were made, comprises about 465 acres, and is situated on the confines of the city of Ottawa, between the Ottawa and Rideau rivers. The atmosphere of this locality, while naturally not free from smoke, may be considered as fairly pure—for Ottawa is not a city characterized by 'tall chimneys,' and besides the few residences on the farm, there is only a single line of railroad in the immediate vicinity. Though all possible precautions were taken against the entrance of extraneous matter, all the samples, both of rain and snow, gave evidence of the presence of a certain amount of dust and soot. The snow was always carefully taken, either during the fall or imme-

*In a paper entitled 'Composition of Rain-Water at Rothamsted' (Journal of Agricultural Science, Vol. I., Part 3, October, 1905), Dr. N. H. J. Miller has brought together and discussed practically all the published and available data on this interesting subject.

diately afterwards, and put at once to melt at room temperature in a clean, large, covered glass vessel. As the snow liquified a small quantity of soot was seen clinging to the sides of the vessel, and a slight deposit formed at the bottom of the jar, though as collected there were no traces of foreign matter—the snow had all the appearance of being absolutely pure.

Samples were collected and analysed, representative of each fall of rain and snow that furnished a sufficient quantity for analysis. In all, 78 samples were analysed, 46 of rain and 32 of snow. The determinations comprised free ammonia, albuminoid ammonia and nitrogen in nitrates and nitrites. The results obtained for each month have been averaged, and from these averages the total monthly amounts of nitrogen in the various compounds per acre were calculated, using the precipitation data recorded on the farm. By this means we have arrived, approximately, at the amount of nitrogen in the snow and rain during twelve months.

Precipitation is measured in inches, and a rainfall of one (1) inch over 1 acre, weighs, approximately, 113 tons 600 lbs. Ten (10) inches of snow are considered the equivalent of one (1) inch of rain.

In the following table are given the monthly totals for the precipitation, the average amounts of nitrogen present in the three forms, as obtained from the several analyses, and the pounds of nitrogen per acre so supplied.

Rain and Snow at Ottawa, for the year ending February 29, 1908.

Month and Year.	Precipitation in Inches.			Nitrogen.				Pounds of Nitrogen per Acre.
	Rain.	Snow.	Total as Inches of Rain.	In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	
1907.				p.p.m.	p.p.m.	p.p.m.	p.p.m.	
March	1·55	11·50	2·70	·225	·049	·193	·467	·286
April	2·59	7·25	3·32	·320	·056	·120	·496	·372
May *	1·56	7·50	2·31	·082	·033	·065	·180	·094
June	2·20	....	2·20	·490	·156	·147	·793	·395
July	3·73	....	3·73	·275	·117	·145	·537	·454
August	1·13	....	1·13	·369	·102	·114	·585	·150
September	3·32	....	3·32	·503	·129	·137	·769	·579
October	2·70	1·00	2·80	·434	·085	·193	·712	·452
November	3·37	5·50	3·92	·349	·063	·064	·476	·423
December	·81	34·75	4·28	·349	·096	·171	·616	·597
1908.								
January	·13	30·25	3·16	·156	·059	·149	·364	·260
February	·96	35·25	4·48	·098	·053	·106	·257	·261
Total for 12 months	24·05	133·00	37·35	....	....	....	....	4·323

The amount of nitrogen in the rain and snow at Ottawa during the year was 4·323 lbs. per acre. Of this 74 per cent, or 3·199 lbs., occurred as ammonia and ammonium salts, and 26 per cent, or 1·124 lbs. as nitrates and nitrites.

In this connection it is interesting to note that Dr. Miller, in the paper already referred to, reports that the average amounts of nitrogen in the forms of ammonia and nitric (and nitrous) acid in the Rothamsted rainfall during 13 years ending 1900-1, is 3·84 lbs. per acre per annum, and that the relative amounts of ammoniacal and nitric nitrogen were 70 and 30 per cent respectively of the total.

* Only one analysis was made this month, the work being interrupted by the making of necessary changes in the collecting apparatus.

The total precipitation for the year ending February 29, 1908, was 37·35 inches, of which 24·05 inches fell as rain and 13·3 (equivalent to 133 inches of snow) in the form of snow.

Of the total nitrogen per acre during this period, 4·323 lbs., we estimate that approximately 75 per cent, or 3·243 lbs. was furnished by the rain and 25 per cent, or 1·080 lbs., by the snow.

The composition as regards the average nitrogen-content of the rain and of the snow is set forth in the following table:—

AVERAGE NITROGEN-CONTENT OF RAIN AND SNOW.

—	No. of Samples.	Precipitation in inches.	Nitrogen. Parts per Million. In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.	Total.	Percentage of Total. In Free Ammonia.	In Albuminoid Ammonia.	In Nitrates and Nitrites.
Rain...	46	24·05	·396	·114	·142	·652	61	17	22
Snow ..	32	133·00	·216	·038	·132	·386	56	10	34

From these data it will be seen that, comparing equal weights of rain and snow water, the total nitrogen-content of snow is very considerably less than that of rain, the latter being much the richer in ammoniacal nitrogen. There does not appear to be much difference between rain and snow as regards nitric nitrogen.

As regards the proportion or distribution of the nitrogen compounds, the averages of the year show that in both rain and snow the proportion as free ammonia is the largest, and as albuminoid ammonia the least. Comparing rain with snow the principal feature to be noted is the larger proportion of nitrogen as nitrates and nitrites in the latter.

It is generally supposed that the richness of the rain or snow in nitrogen compounds is largely influenced by the period elapsing between the precipitations and, similarly, that the first part of the fall will have the higher nitrogen content. Our data while not uniformly supporting this view, furnish evidence in a number of instances that such is the case. From the smaller percentage of nitrogen compounds in snow, to which we have already called attention, it might be conjectured that the solvent and absorbent action of snow was less than that of rain—and this appears to be the case. Thus snow fell to a depth of 8·75 inches during the early morning hours of December 30, which on analysis was found to contain ·09 parts per million of nitrogen as free ammonia, ·086 as albuminoid ammonia and ·115 as nitrates and nitrites, a total of ·291 parts per million of snow water. Later in the day, about 10.30 a.m., the temperature rose slightly and the snow turned to a light rain, of which a precipitation of ·15 inches was recorded. Upon analysis this rain water gave ·238 ·271 and ·592 p.p.m. of nitrogen in the form of the compounds mentioned, making a total of 1·101 p.p.m.

It is true that total amounts of combined nitrogen removed from the air by this snow fall (equivalent to ·058 lbs. per acre) was greater than by the subsequent rain (equivalent to ·037 lbs. per acre), but this does not affect the question under discussion, the relative solvent action of rain and snow, save in so far as it may serve to accentuate the greater solubility of the nitrogen compounds in the rain. For, after the removal of such notable quantities of impurities by the prolonged snow-fall, the subsequent light rain dissolved from the already partially purified atmosphere a proportionately greater amount.

The rain and snow, as we have seen, by their cleansing action upon the atmosphere furnish our soils annually with a notable amount of that most important constituent of plant food, nitrogen, in a form extremely available for crop use. It is important, however, to point out that while our data support the widely accepted view that snow is a direct fertilizer, it is very evident that its value in this respect has been greatly over-estimated by many of our farmers.

PURIFICATION OF WATER BY FREEZING.

In the course of certain investigations during the past year, data were obtained illustrative of the purification of water by freezing, and which being of an interesting character may here be very briefly set forth.

In the first case the problem to be considered was the relative purity of the ice for domestic use, from the Ottawa and Rideau rivers. In the resulting analyses marked differences from those of the waters were found, more especially as regards the amount of dissolved organic matter.

The waters of both rivers are 'peaty,' highly coloured and of small mineral content. The large quantity of vegetable matter in solution, is brought out by the high figures for albuminoid ammonia, and the low 'solids after ignition' make evident the extremely small amount of saline matter present.

RESULTS of Analyses in Parts per Million.

—	Ottawa River, above Chaudiere Falls.		Rideau River, above Billings Bridge.	
	Water, November.	Ice, February.	Water, November.	Ice, February.
Free ammonia	·012	·04	·024	·06
Albuminoid ammonia	·227	·041	·4	·135
Nitrogen in nitrates and nitrites	·113	·049	·034	·049
Chlorine	·6	·05	2·5	·15
Total solids at 212° F.	56·0	4·4	145·2	5·4
Solids after ignition	24·8	Traces.	82·8	Traces.

It is at once apparent that in freezing a very large quantity of dissolved organic matter has been eliminated. Taking first the albuminoid ammonia as an index of this peaty matter, it will be noticed that the reduction by freezing in the case of the Ottawa river is from ·227 p.p.m. to ·041 p.p.m., and in that of the Rideau river from ·400 p.p.m. to ·135 p.p.m. Similarly with the 'Total Solids,' practically half of which is organic matter, the reduction from freezing has been from 56 p.p.m., and 145·2 p.p.m. to 4·4 p.p.m. and 5·4 p.p.m., respectively. The chlorine is also much reduced, and the mineral matter (solids after ignition) entirely disappears.

The degree of purification is dependent on several factors. According to recognized authorities, ice forming on deep water is purer than on shallow water—the quality of both waters being initially the same. The slower the ice formation, the purer the ice. The thicker the ice, within certain limits, the purer it is; and, lastly, it is held that the lower part of the ice block will be of better quality than that nearer the surface.

Purification by freezing is, after all, however, but partial. Undoubtedly under the most favourable conditions a very large proportion of the mineral and organic constituents may be thrown out, and the bacterial content considerably reduced; but it has been clearly shown that the elimination is never such that the ice cut from a polluted source is safe for domestic purposes.

The second instance illustrates the effect of freezing on a highly saline or 'alkali' water. In June last, two samples of water were forwarded from Kingsview, Sask., the one representative of the water of a small lake in that locality collected in May, the other from ice taken from the surface of the lake the previous winter. In

this district, it is stated the rainfall is usually very light and, therefore, one in which it is desirable to have provision for irrigation, if water can be obtained for that purpose free, or practically free, from 'alkali.' It has occurred to our correspondent that although the water in the lake during the summer was too saline, possibly the ice might furnish a water sufficiently free to be safe for such use. The following data were obtained:—

——	From Water of Lake Collected May, 1907.	From Ice of Lake Collected Winter, 1906-07.
	p. p. m.	p. p. m.
Total solids at 212° F.	1525·2	90·4
Chlorine	225·0	11·1
Sulphuric acid (SO_3)	379·6	17·6
Alkalies	688·1	

The water of the lake is much too saline for irrigation purposes, containing approximately, in parts per million:

Sodium chloride (common salt)	371·3
Sodium sulphate (Glauber's salt)	674·0
Sodium carbonate (washing soda)	535·0

The continued use of such a water would tend to the accumulation in the surface soil of these salts, thus making it unsuitable for crop growth.

On the other hand, the water from the ice is practically free from saline matter and would prove excellent, from this standpoint, for domestic and stock use as well as for irrigation. The extent to which the saline matter is eliminated in the freezing of the water is certainly noteworthy.

How far this method of purification can be utilized for obtaining a sufficient supply of water suitable for irrigation from highly saline sources, the writer cannot say—though our correspondent thought the plan of draining the lake after freezing one which was quite feasible in the present case. In this way the highly charged saline water could be got rid of, the water from the ice taking its place in the spring. Be that as it may, it seems quite practicable to secure a sufficiency of ice, which if well stored would furnish a supply of good drinking water throughout the year. In many districts saline water only is at present obtainable; in these neighbourhoods such a water as that from the ice of this lake would be a great boon. To put this principle into practice is not necessarily expensive, and it is certainly worth considering by those who find it impossible to conveniently obtain a supply free from 'alkali' or saline matter.

SALINE DEPOSITS.

Salt.—A very interesting sample of salt was sent in for analysis by Mr. E. B. Young, Superintendent, Railway and Swamp Lands, Department of Interior. It was collected on Salt river, which flows into Slave lake, 70 miles above Lake Athabaska. As received it contained a considerable amount of foreign matter, such as fragments of wood, sand, dust, &c., and which I think were accidental impurities and not present in the salt as found.

Analysis of Salt.

	Per cent
Chloride of sodium (common salt)	91·17
Sulphate of sodium (Glauber's salt)	5·98
Sulphate of lime	·51
Undetermined (impurities mentioned, &c.)	2·34
	100·00

Sulphate of Soda.—Marriott, Sask.—In December last a sample of a white crystalline salt was received from this locality and subsequently submitted to analysis. Its occurrence is described as follows: 'It can be taken from the lake here in large quantities at this time of year, being on the ice, partly frozen with the ice and an abundance under the ice. It is not visible in the summer.'

Analysis.

	Per cent.
Water (chiefly of crystallization)	51·62
Sodium sulphate (Glauber's salt)	48·47
Sodium chloride (common salt)	·26
Magnesium sulphate (Epsom salts)	·44
	100·79

It is essentially sulphate of soda, containing a small amount of sulphate of magnesium with traces of common salt, and may be regarded as a very prevalent form of 'white alkali' found in semi-arid districts.

ASPHALTUM (SEMI-SOLID BITUMEN).

From a spring on an island in the Peace River district, twenty-five miles below Peace River Crossing.

Analysis.

	Per cent.
As received—	
Moisture and loss on drying at 100° C.	29·07
Acetone extract (petrolene)	50·62
Chloroform extract (asphaltene)	12·67
Non-bituminous organic matter	1·95
Ash	5·69
	100·00

	Per cent.
Calculated to water-free material—	
Petrolene	71·37
Asphaltene	17·86
Non-bituminous organic matter	2·75
Ash	8·02
	100·00

While not in a position to speak as an expert as to its commercial value, I may say that the percentage of asphaltene falls well within the limits set for good asphalts, and also that the percentage of ash is comparatively low. The indications are, therefore, that a refined asphalt could be prepared from this crude material that would be suitable for paving work.

STRYCHNINE.

In the report of this Division for 1894 the use of strychnine for the extermination of gophers is dealt with, and full directions given for the preparation of the poisoned grain.

It is very doubtful if strychnine or strychnine sulphate (frequently used in place of strychnine owing to its greater solubility) as generally found in commerce, is adulterated. A number of samples, in the crystalline condition, are annually received from the Northwest, and so far they have always proved to be pure. In certain

districts of Manitoba and Saskatchewan, however, strychnine is put up and supplied in solution at the instance of the municipality, and it then becomes a matter of some moment to know if the amount of strychnine per fluid ounce or per bottle contracted for is being furnished. To determine this, an analysis is necessary. Every season a certain number of such samples are received and examined. The following data are those obtained last year:—

STRYCHNINE IN SOLUTION.

Sent by.	Prepared by.	Strychine.	
		Per cent.	Grains per Bottle.
H. W. J. Chatter, Man.	Halpin & Co.	3·94	28·65
" "	"	3·58	54·09
A. C. McPh., Brandon, Man		3·47	29·45
" "		2·28	31·91
R. R. Elton, Man	D. Clement, Brandon, Man.	2·26	35·49

WELL WATERS FROM FARM HOMESTEADS.

During the past year 126 samples of well waters from farm homesteads were received. Of these 65 were submitted to analysis, the remaining samples, not being collected in accordance with the instructions issued, were not examined.

The 65 waters reported on may be classified as follows: Good and wholesome, 26; suspicious and probably dangerous, 18; seriously polluted, 12; saline, 9. The tabulated data are appended.

The danger of the barnyard and backdoor well has been repeatedly pointed out. The water in such wells is always liable to become polluted, if not with actual excrementitious matter, at least with its decomposition products, and in the majority of instances there can be no certainty that such have been thoroughly oxidized and rendered harmless. It is gratifying, therefore, to note that every year sees a larger number of farmers procuring their water at reasonably safe distances from possible sources of contamination. It is, further, very satisfactory to find that many farmers are piping such supplies to their houses, stables and cow barns.

It is of the first importance, of course, that there should be an abundant supply of pure water for drinking purposes, but it is also a matter of considerable moment, from the standpoint of convenience and comfort, to have the supply piped into the house. It makes possible what to-day in many country homes is impossible—a bathroom. It is the possession of 'modern conveniences,' in the town and city home that very largely makes the difference between city and country life, to the detraction of the latter. A water supply and a septic tank system for the disposal of the sewage, both quite feasible on the larger number of farms, are not necessarily expensive, and should not be regarded as luxuries, for they mean better health, greater comfort and less labour.

As far as may be practicable the writer will be pleased to advise correspondents in regard to the location of the site for the well or the establishment of a water-supply from brook, river or lake. Particulars respecting the septic tank system for the disposal of sewage are given in the report of this Division for 1904. Directions for the collection and shipment of water for analysis are forwarded on application.

ANALYSES OF WELL WATERS, 1907.

RESULTS STATED IN PARTS PER MILLION.

Number.	Locality.	Marks.	Date.		Free Ammonia.	Albuminoid Ammonia.	Nitrogen in Nitrates and Nitrites.	Chlorine.	Total Solids at 105° C.	Solids after Ignition.	Loss on Ignition.	Phosphates.	Report.
			1907.										
1	Maniwaki, Que.	A. R.	Apr.	18	·09	·085	·008	36·3	217·6	147·2	70·4	Traces	Very suspicious.
2	Winchester, Ont	A. S.	"	30	·02	·11	6·831	240·0	1196·8	928·8	268·0	H. traces	Polluted.
3	Lanark, Ont.	B. C. & Co	May	15	Free.	·185	4·54	10·0	421·6	280·0	141·6	"	Possibly safe.
4	"	"	"	15	·215	·05	1·64	4·0	284·0	173·6	110·4	Traces	Highly suspicious.
5	Appleton, Ont.	"	"	20	Free.	·105	3·706	14·5	425.2	292·0	133·2	"	Rather suspicious.
6	Smithville, Ont.	W. W.	"	20	1·08	·125	Free.	340·0	3105·6	2407·2	698·4	"	Saline water.
7	Forest, Ont.	E. T.	"	30	Free.	·24	12·77	47·0	694·4	645·6	48·8	"	Suspicious.
8	Appleton, Ont.	D. W. F. C.	June	6	·03	·068	4·554	13·5	386·4	284·0	102·4	H. traces	"
9	Hull, Que	G. H. M.	"	21	Free.	·085	1·36	20·0	389·6	246·4	143·2	Free.	A very good water.
10	Crysler, Ont	T. F.	"	24	·21	·11	·008	7·5	429·2	303·2	126·0	Traces	Probably wholesome.
11	Ottawa, Ont	J. B.	"	25	Free.	·215	·362	1325·0	2622·0	2426.0	196·0	H. traces	Saline water.
12	Arnaud, Man.	L. B.	July	2	1·81	·195	·765	1615·0	4486·0	3790·0	696·0	"	Very saline.
13	Kirk's Ferry, Que.	J. S. B.	"	8	Free.	·15	·825	8·0	188·0	127·2	60·8	Traces	Free from pollution.
14	Fort Saskatchewan, Alta.	E. M.	"	15	·120	·130	·700	10·0	299·2	210·8	88·4	H. traces	Suspicious.
15	New Glasgow, N.S.	G. T. No. 1	"	15	·100	·285	Free.	20·0	204·8	140·0	64·8	"	Unfit for drinking purposes.
16	"	" " 2	"	15	·210	·225	·305	22·0	216·0	151·2	64·8	"	" "
17	"	" " 3	"	15	·090	·255	·840	17·5	136·0	92·0	44·0	"	" "
18	Minburn, Alta.	M. J. K.	"	23	·345	1·035	Free.	415·0	11000·0	10598·0	402·0	"	Saline water.
19	St. Charles, Man.	B. N. Co.	"	27	·615	·045	Free.	900·0	4219·0	3764·0	455·0	Free.	"
20	Red Willow, Alta.	T. I.	"	29	·240	·262	Free.	4·0	397·0	269·0	128·0	Traces	Suspicious.
21	Amulree, Ont.	J. M.	"	29	·040	·060	3·540	10·0	310·0	170·8	139·2	H. precip.	Unpolluted.
22	Chelsea, Que.	A. S. C.	"	30	·43	·046	Free.	2·0	235·2	164·8	70·4	H. traces	Suspicious.
23	"	Mrs. J. H.	"	30	Free.	·085	5·402	76·0	441·6	250·0	191·6	Traces	Contaminated.
24	Compton, Que.	Miss N. P. B.	Aug.	8	·150	·105	·405	2·0	217·6	125·6	92·0	"	Seriously contaminated.
25	Mahone Bay, N.S.	D. G. S.	"	12	1·450	·130	7·600	58·0	290·4	188·0	102·4	"	"
36	Ottawa, Ont.	W. G. K.	"	12	Free.	·156	1·110	8·0	292·0	194·0	98·0	"	Suspicious.
27	Little Britain, Ont	J. F. D.	"	19	·020	·040	17·85	63·0	625·2	403·6	221·6	"	Polluted.
28	Hargrave, Man.	W. B. P.	"	19	2·715	·760	8·55	1200·0	15273·6	11640·0	3633·6	"	Saline water.
29	Barwick, Ont.	W. B. W.	"	20	·050	·125	·123	1·0	171·0	100·0	71·0	"	Excellent water.
30	Carievale, Sask.	J. B.	"	24	1·475	2·61	3·000	55·0	5364·0	4490·0	874·0	"	Saline water.
31	Pheasant Forks, Sask.	W. F. S.	"	24	·660	·085	·379	32·0	3035·0	2393·0	642·0	"	"
32	Chilliwack, B.C.	G. M. S.	"	26	Free.	·020	Free.	6·5	149·2	108·4	40·8	V. sl. traces.	Pure and wholesome.
33	St. Hyacinthe, Que.	S. de St. J.	"	29	·375	·130	·061	32·0	440·0	274·4	165·6	H. traces	Suspicious.
34	Ganges, B.C.	L. G. T.	Sept.	7	·030	·020	·008	4·0	96·0	66·4	29·6	Traces	Wholesome.
35	St. Hyacinthe, Que.	S. de St. J.	"	9	·320	·060	·107	32·5	427·2	301·6	125·6	"	Suspicious.

36	Millstream, N.B..	W. D. F.	"	12	·030	·085	1·040	10·0	98·4	66·0	32·4	Free	Suspicious.
37	Smith's Falls, Ont	J. H. S.	"	23	·125	·515	·012	5·5	160·0	71·0	89·0	Traces	Contaminated.
38	Owen Sound, Ont.	L. H. C.	"	28	6·555	·075	·729	28·0	388·8	245·6	123·2	V. sl. trace.	Suspicious.
39	St. Hyacinthe, Que	F. A.	Oct.	5	·810	·277	Free.	21·0	595·0	542·0	53·0	H. traces	Probably wholesome.
40	"	S. de St. J. No. 1	"	7	·535	·060	·191	30·5	432·4	284·8	147·6	Traces	Suspicious.
41	"	" " 2	"	7	·010	·410	·107	5·25	109·6	50·4	59·2	"	Probably wholesome.
42	Chelsea, Que	Mrs. J. H.	"	10	Free.	·070	2·464	10·0	162·8	114·8	48·0	"	"
43	Victoriaville, Que	C. of S. C.	"	21	·045	·050	·169	6·2	432·4	307·2	125·2	"	Good and wholesome.
44	St. Hyacinthe, Que	F. A. No. 1	"	26	·795	·307	Free.	22·0	631·0	591·0	40·0	H. traces	Probably wholesome.
45	"	" " 2	"	26	·075	·195	·020	6·0	96·0	32·0	64·0	Free	"
46	Rideauville, Ont.	W. I.	"	29	Free.	·050	8·885	35·0	531·0	268·6	270·4	Traces	Suspicious.
47	Lethbridge, Alta	W. H. F.	"	30	·090	·410	·025	9·5	453·2	248·8	204·4	"	Probably polluted.
48	Forest, Ont	J. S.	Nov.	4	·225	·080	Free.	103·0	600·8	523·2	77·6	Free	Probably unpolluted.
49	Ottawa, Ont	Dr. C. H. H.	"	4	·115	·345	·341	65·0	353·2	221·2	132·0	Traces	Seriously polluted.
50	Almonte, Ont.	R. W. Co.	"	6	·280	·065	·905	17·0	455·2	336·4	118·2	Free	Dangerously polluted.
51	"	A. R.	"	9	·010	·060	3·12	8·00	260·0	179·2	80·8	"	Suspicious.
52	"	B. R. No. 1	"	23	·010	·087	·107	·5	80·0	44·0	36·0	H. traces	Good and wholesome.
53	"	" " 2	"	23	·010	·065	·107	·5	81·6	38·8	42·8	"	"
54	"	" " 3	"	30	·010	·070	·080	1·0	112·8	56·0	56·8	"	Safe and wholesome.
55	Kingston Station, N.S.	R. McM.	Dec.	9	Free.	·020	·049	7·0	103·6	82·0	21·6	Free	Excellent.
56	South Bay, Ont	N. R.	"	23	·010	·060	·403	10·0	381·2	268·4	112·8	"	Probably wholesome.
			1908.										
57	Upper Kennetcook, N.S.	W. A.	Jan.	2	·140	Free.	·008	1875·0	5780·0	5036·0	744·0	H. traces	Saline water.
58	Almonte, Ont.	B. R.	"	8	·140	·070	·090	5·9	362·0	234·4	127·6	"	Probably safe.
59	"	W. C.	"	11	Free.	·110	1·900	52·0	681·6	511·2	170·4	"	Suspicious.
60	Hull, Que	No. 1	"	13	·010	·160	·115	·68	71·2	35·2	36·0	Traces	Pure and wholesome.
61	"	J. B. No. 2	"	13	·010	·140	·112	·76	63·2	27·2	36·0	Sl. traces	"
62	Hintonburg, Ont	P. S.	"	13	·010	·170	·156	·68	84·8	47·2	37·6	H. traces	"
63	Sault au Recollet, Que	J. F. No. 1	Mar.	3	·005	·340	·070	·5	32·0	10·4	21·6	Sl. traces	Unpolluted.
64	"	" " 2	"	3	Free.	·070	·033	Free.	11·2	1·6	9·6	Free	"
65	Lancaster, Ont.	J. McB.	"	12	Free.	·675	2·54	11·0	372·0	291·2	80·8	Sl. traces	Very suspicious.

REPORT

OF THE

ENTOMOLOGIST AND BOTANIST.

(James Fletcher, LL.D., F.L.S., F.R.S.C., F.E.S.A.)

1907-1908

Ottawa, April 1, 1908.

Dr. Wm. Saunders, C.M.G.,
Director of Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to hand you herewith a report on some of the more important work done in the Division of Entomology and Botany during the year ending March 31, 1908.

The applications for help in fighting insects and weeds from all parts of the country increase in number every year, and many farmers and others visit the Division for advice, or to examine the cabinets to identify plants or insects which are giving them trouble. The demand for help from school teachers and students has increased enormously during the past year or two, since nature study has been recognized as a useful part in a common sense education. Many addresses have been given by the officials of the department on various occasions to help along this movement.

Collections.—The collections in the Division have been much increased during the past year. A large number of specimens have been added to the Herbarium, and the whole has been arranged according to Prof. John Macoun's Catalogue of Canadian Plants, and a card index of the specimens has been completed. In the collections of insects satisfactory progress has been made. The large and valuable collection of noctuid moths has been rearranged, and a large number of specimens which, were lacking, have been procured either by collecting or rearing them, or from correspondents. This class of insects contains the various species of cutworms, some of which every year are the cause of such serious depredations on farm crops. It is always a great surprise to those who find the unsightly cutworms attacking their young plants, when they are shown the moths which come from these caterpillars, many of which are of considerable beauty, notwithstanding the general character of inconspicuous colouring which prevails among the Noctuidæ. Several gaps in our cabinets have been filled in with specimens reared from eggs sent to the Division by correspondents in all parts of the Dominion. Many of these insects are of extreme rarity, and, by getting eggs and then rearing the insect through all its stages, not only are more perfect specimens secured, but, what is far more valuable, a knowledge is acquired of the complete life history of each species, and as it is usually an easy matter to rear insects from the egg, large series showing the range of variation in colour, markings and size are thus secured. The value of the life history of an insect, how it passes the winter, when the eggs hatch and how long a time elapses before the larva becomes full grown and produces the mature form, are facts of enormous importance in devising a remedy

for any species which may have proved destructive to crops. Many insects, particularly moths, lay eggs freely in confinement if enclosed in any small box such as a small cardboard, wooden or tin box, three or four times the size of the specimen. These eggs should be sent off to the Division at once, as most of them hatch in eight or ten days; parcels thus sent have been safely received from the extreme limits of the Dominion, from British Columbia, from Nova Scotia and the far north. The caterpillars, on hatching, are cared for in Ottawa, and the large number of perfect specimens in our collections show to what advantage this method of obtaining specimens and useful information on life-histories may be used. It may be well to mention here to all who are good enough to send in specimens, that full directions as to packing and forwarding such material as plants and insects are given at page 212 in this report.

Among the more important donations which have been made to the entomological collections during the past year, the following may be mentioned:—

Thos. Baird, High River, Alta.—A large number of specimens of rare moths from western Alberta.

J. W. Cockle, Kaslo, B.C.—Several interesting insects from the Kootenays.

The Messrs. Criddle Brothers, Aweme, Man.—Many species of local insects from central Manitoba.

Paul Hahn, Toronto.—Specimens of insects from Niagara Glen and Toronto, including a specimen of *Apantesis virgo* L. var. *citrinaria* N. & D.

Horace Dawson, Hymers, Ont.—Larvæ and moths of the genus *Papaipema,* also supposed larvæ of *Platypsylla castoris* Ritzema.

Edward Denny, Montreal.—A fine pair of the rare moth *Hepialus thule* Strk.

Dr. C. A. Hamilton, Mahone Bay, N.S.—Several interesting species of injurious insects.

A. W. Hanham, Duncans, B.C.—A large collection of British Columbian hymenoptera, diptera and lepidoptera.

W. Metcalfe, Ottawa.—Several boxes of mounted micro-diptera and a few other insects.

Joseph Perrin, Halifax, N.S.—Moths and butterflies from MacNab's Island.

John Russell, Digby, N.S.—Several rare species of Nova Scotian moths and butterflies, including a fine specimen of *Catocala cœlebs,* Grt.

N. B. Sanson, Banff, Alta.—Specimens of Rocky Mountain larvæ, including *Neoarctia beanii,* Neum.

J. B. Wallis, Winnipeg, Man.—Several specimens from Peachland, B.C., chiefly lepidoptera and coleoptera.

C. H. Young, Ottawa.—Eggs of rare Ottawa moths and mounted specimens of lepidoptera and coleoptera which were required to complete series in our cabinets, all beautifully mounted.

A large number of additions have also been made to the collections from material sent in for names by entomologists, farmers and others.

The botanical collections have been enriched from the following sources:—

J. R. Anderson, Victoria, B.C.—British Columbian plants.

A. Arsenault, Adamsville, N.B.—A monstrous form of *Leontodon autumnalis,* L.

The Messrs. Norman and Evelyn Criddle, Aweme, Man.—Seeds, living roots and herbarium specimens of Manitoba plants.

Norman Criddle, Aweme, Man.—A collection of paintings of Manitoba violets.

George Fraser, Ucluelet, B.C.—Rare plants from Northern British Columbia, including living roots of *Viola langsdorfii,* Fisch.

Rev. L. Gladu, St. Boniface, Man.—Botanical specimen of *Œnothera caespitosa,* Nutt.

Dr. W. Grignon, Ste. Adele, Que.—Living roots and stratified seed of Ginseng, *Aralia quinquefolia,* Dec. & Plan.

Dr. C. A. Hamilton, Mahone Bay, N.S.—A collection of 45 named species and varieties of Nova Scotia sea weeds.

David P. Kane, Kaslo, B.C.—British Columbian ferns, including a magnificent root of *Adiantum pedatum*, L., var. *rangiferinum*, Burgess and Macoun.

Rev. J. H. Keen, Metlakatla, B.C.—Specimens of *Gentiana Douglasiana*, Bong., and rare insects from northern British Columbia.

Mrs. D. W. Stewart, Renfrew, Ont.—Living roots of violets and specimens of *Medicago falcata*, L.

Mrs. Stoker, Cowichan Lake, B.C.—A large collection of the seeds of 147 species of Vancouver Island plants.

Dr. Douglas G. Storms, Hamilton, Ont.—Roots of *Trillium grandiflorum*, Salisb., abnormal form with green flowers.

E. P. Venables, Vernon, B.C.—Local plants from Vernon, B.C., including *Cynoglossum occidentale*, Gr.

Rev. Frère Marie Victorin, Longueuil, Que.—Specimens of *Butomus umbellatus*, L., and *Sambucus Ebulus*, L., first found growing wild in Canada by the sender.

Correspondence.—The correspondence of the Division has shown a considerable increase over that of previous years, and the number of subjects inquired about has shown that the Division is becoming well known as a source of information with regard to all matters relating to the scientific consideration of insects and plants in connection with agriculture and horticulture. The number of letters exclusive of circulars entered in the Division register, as received from April 1, 1907, to April 1, 1908, was 4,030, and the number despatched 3,640. Articles relating to outbreaks of insects, the treatment of well-known pests and the best methods of dealing with noxious weeds have been prepared for local newspapers and for agricultural journals, whenever required. Many of these have been at the request of correspondents who have intimated that they were of general interest.

Meetings.—Meetings of farmers' institutes and other agricultural associations, teachers' associations, &c., have been attended by the Entomologist and Botanist whenever other official duties would permit.

June 7, 1907: Annapolis Royal, N.S.—A convention of fruit growers to consider the best measures to adopt to control the Brown-tail moth. An address was given on the habits of this insect and its history in America. A full and interesting discussion was carried on, and much information elicited with regard to the localities where it had occurred in Nova Scotia, and the vigorous steps which were being taken by the Provincial Secretary for Agriculture for Nova Scotia.

June 23 and 24: Boston, Mass.—By invitation of the legislative committee of the Commonwealth of Massachusetts, through Mr. A. H. Kirkland, Superintendent for suppressing the Gypsy and Brown-tail moths and with the approval of His Excellency Governor Curtis Guild, Jr., I was invited to be one of fourteen entomologists, from all parts of the world, to inspect and report upon the extensive work which had been done in the New England States in fighting against the Gypsy and Brown-tail moths, and particularly with regard to the importation of parasites of these insects from Europe. On June 24 I visited the laboratories at Saugus, Mass., with Superintendent A. H. Kirkland, and the following day, in company with Prof. John B. Smith, State Entomologist for New Jersey, Dr. E. P. Felt, State Entomologist for New York, Mr. Kirkland and Mr. F. H. Mosher, we covered a great deal of ground in an automobile and examined the work which had been done in clearing street trees, parks and woodlands from these aggressive enemies. The success of this whole movement, both in fighting against these caterpillars by the ordinary means and by the extensive importation of parasites, has been so remarkable that I was much pleased to have this opportunity of examining into the details of the work in the company of the experienced entomologists above named. The whole work forms without doubt the most remarkable experiment which has ever been tried in economic entomology. That in only two seasons 8,000 miles of streets should have been practically freed of devastating caterpillars of two of the worst known pests of shade trees, is a triumph of applied

science which must be of great encouragement to all engaged in such work, and is an indication of what may be hoped for in the near future in Massachusetts, if the same plan of action is persisted in under the same capable and energetic management. The systematic colonizing of parasites of these pests has been carried on under the direction of Dr. L. O. Howard, the United States Entomologist, and the condition of affairs at the present time is very hopeful and demonstrates the wisdom which has been shown by Superintendent Kirkland and Dr. Howard in carrying out this vast experiment. During last year over 100,000 parasites of different forms, chiefly *Pteromalids* and *Tachinids,* were liberated, and there are evidences that many of these are successfully established and that they are working on the insects for the control of which they were introduced. At the present time the field work is going on with a large measure of success, and the people of the State are well satisfied with it as well as with the work of introducing parasites.

July 4: Guelph, Ont.—Summer meeting of the Entomological Society of Ontario. Addresses on 'The Control of the Brown-tail and Gypsy moths in America, with special reference to the Importation of Parasites,' and 'Nature Study as a means of Education.'

July 12 to 31 in Manitoba and the Northwest Provinces:—

July 12 to 15, Aweme, Man., visiting Mr. Percy Criddle at St. Alban's, near Aweme, with Dr. Henry Skinner, of Philadelphia. Collecting insects and plants, at Aweme and in the Douglas sand-hills, where many valuable and interesting specimens were secured.

July 16: Brandon.—Visiting Experimental Farm.

July 17: Regina.—Examining the country around Regina with Mr. Willing. In the evening held a meeting of the Northwest Natural History Society in the Provincial Museum. Address 'The Practical Value of Natural History Studies.' This was the first of a series of meetings held by Mr. T. N. Willing, the Chief Provincial Weed Inspector, Dr. Henry Skinner and myself, at which addresses were given upon weeds and their eradication, the interpretation of the Weed Ordinance and the part played by insects in the transmission of various diseases.

July 18.—Left Regina for Hanley, where a well attended meeting was held in Rollefson's store, Mr. D. McLean in the chair. Questions were asked as to the treatment of Hare's-ear Mustard and Skunk-tail grass. The value of summer fallowing was also discussed.

July 19.—Left Hanley and drove to Rudy, where a good meeting of about forty was held at 3 p.m., Mr. William Duncan in the chair. On account of the heat this meeting was held outside the stopping place.

July 20.—Left Rudy at 9 a.m., and drove to Tessier, 27 miles. Stayed with Dr. Tessier, who had gathered together about 50 farmers from this new and exceedingly rich district. The meeting was held out of doors in the evening, and was prolonged on account of the many questions until a late hour. Keen interest was shown in the subjects treated of.

July 21.—Started from Tessier at 8 a.m., and drove 54 miles into Saskatoon. The crops throughout this whole district were excellent, and the country is settling up quickly.

July 22: Saskatoon.—A meeting was held at 1.30 p.m., Mr. John Ashworth in the chair. In the afternoon we took train for Duck Lake, where a meeting was held in the evening.

July 23.—Drove from Duck Lake to Skipton School, 25 miles, which was reached by 3.30 in a heavy and severe hailstorm. After the meeting we drove on to Parkside, another 14 miles, for the night, where we were kindly put up by Mr. George Alamanofski.

July 24.—Drove from Parkside to Shellbrook, 12 miles, where we held a meeting in the afternoon, which was not very well attended, owing to a heavy rainstorm. We left Shellbrook in the evening at 7 a.m., and drove into Prince Albert, 32 miles, through the sand hills, arriving by midnight.

July 25.—Left Prince Albert at 10 a.m., and drove 48 miles to Kinistino, where a good meeting was held in the evening, in the main street of the town. At this meeting several ladies were present, and many questions were asked about insects injurious to crops.

July 26.—Took train to Star City, where a small meeting was held at 3 o'clock in the afternoon.

July 27.—Took train for Prince Albert, arriving soon after noon. In the afternoon we drove out to hold a meeting at Birson, and afterwards visited the Weed Inspector, Mr. George Connors.

July 29.—Left Prince Albert for Warman, where a good meeting was held in the afternoon in the implement shed of the Saskatchewan Trading Company. Most of those present were Mennonites. We left Warman at 3.20 for Radisson.

July 30.—Collecting on the sand hills at Radisson in the morning, and in the afternoon at 2 o'clock, a large meeting was held with Mr. George Langley, M.L.A., in the chair. We left the same afternoon, and arrived at Lloydminster before midnight.

July 31: Lloydminster.—A large meeting was held in the afternoon, Mr. Jones in the chair. In addition to the other subjects usually spoken of at these meetings, the value of Brome grass was discussed. Seeing the lack of good hay in the district, I urged the settlers very strongly to cultivate this valuable grass, which is not only a source of a very large supply of succulent and highly nutritious fodder and hay, but is very early and also bears late into the autumn. It was explained that this grass had been introduced and was still highly recommended as a source of feed for stock. Many adverse reports which were made against it, were by those who had found trouble in keeping it out of tree plantations, or who did not want to give the proper amount of work to cultivating their land. Awnless Brome grass is a succulent vigorous-growing perennial grass which roots deeply and therefore is rather troublesome to eradicate when the land is required for other crops; but it produces more hay and of higher quality than almost any other grass that can be cultivated. It is specially suited for the soil and climate of the Northwest, where in many places grass is one of the most desirable crops. The seed is easily threshed and handled and has a ready market. Many of the farmers in the Northwest have told me that they owed their prosperity mainly to this grass. The difficulty of eradicating it from the land is, I believe, much exaggerated, and those who have tried it find that they can destroy Brome sod by breaking and back setting in the same way as the native grasses on the prairie. When it is wished to renew a piece of Brome pasture or meadow, this may be ploughed shallow in autumn or early spring, which, as the grass is very deep-rooted, stimulates growth and renews the stand. In districts where the soil is light and apt to blow, there is no better way of putting humus and fibre into the soil than by growing a crop of Brome; and, from a careful consideration of this question, I am convinced that no farmer in the Northwest can afford to condemn Brome grass on the dictum of other people; but should try a small patch of this valuable grass on his farm. Where farmers think more of their ornamental tree plantations than of their farm crops, or if they can make more money out of growing trees, the conditions of course are different, as undoubtedly Brome grass or any other plant growing among trees will rob them of moisture and stunt their growth. This meeting was the last of the series. The meetings were well attended throughout, and a keen interest was shown in the subjects treated of. Mr. Willing's extensive knowledge of farming conditions and farm practice in all parts of the Northwest made him a valuable source of reference to all who wanted information on these matters. Dr. Skinner delighted the audiences with his clear and definite presentation of his subject. He showed the great danger of allowing house flies free access to houses or places where food was kept, and explained the method of transmission of diseases by the various kinds of mosquitoes which carry yellow fever, malaria, &c. He also dealt with other blood-sucking insects, and showed conclusively the value of a knowledge of insect life both to farmers and to dwellers in cities. My own addresses

dealt with the particular farm weeds prevalent in the various districts visited, the agricultural treatments best suited for their control and the answering of questions concerning special pests, both plants and insects.

August 2: Banff, Alta.—Collecting and examining the collections in the Banff National Museum with Mr. N. B. Sanson.

August 3, 4: Laggan, Alta.—Collecting around Lake Agnes and on the mountains around Laggan, where many rare plants and insects were secured.

August 6: Vancouver.—Inspecting the fumigating station. Left for Victoria the same evening.

August 8.—Left for Duncans with Mr. Tom Wilson to inspect work done for the Department of Indian Affairs in clearing the Indian orchards of pests which it was alleged were a danger to the orchards of the white settlers. We were accompanied by Mr. W. M. Robertson, Indian Agent for the Cowichan Agency, who was of much use to us when treating with the Indians.

August 9.—Returned to Victoria. Consulted with Mr. A. W. Vowell, Indian Superintendent for British Columbia, as to carrying on the work in the Indian orchards for the future.

August 10.—Had a conference with the Hon. R. G. Tatlow, Minister of Agriculture, and afterwards with the Premier, the Hon. Richard McBride, with regard to the work which was being done in the Indian orchards.

August 11.—Left for Agassiz, which was reached the same night.

August 12.—Visited Sir Arthur Stepney's hopyards, where a remarkable outbreak of a flea-beetle, *Psylliodes punctulata*, Melsh., has been doing much harm for several years. Left for Kamloops and reached there at 6 o'clock the same evening.

August 13.—Visiting orchards and giving advice on the treatment for Codling Moth, of which there is a rather severe outbreak at Kamloops. There was to have been a meeting of the Fruit Growers' Association at this place, but through some misunderstanding it had not been arranged for. We were, however, able to meet several of the fruit growers. Left for Revelstoke the same evening, and the next day proceeded to Kaslo.

August 15: Kaslo.—Visiting orchards all day with Mr. J. W. Cockle, who had been making investigations into the life-history of the Codling Moth in this locality, and had also treated carefully a few trees which had been found to be infested by the San José Scale the previous year. It was satisfactory to find that, although the Codling Moth was abundant, the San José Scale was entirely destroyed on the treated trees, and not a single specimen could be found in the locality. In the evening a well attended meeting was held in the town hall, and a great many questions were asked concerning the cultivation of fruit trees, and the insect enemies most likely to occur in the Kootenays.

August 19: Nelson.—A large meeting of fruit growers was held in the town hall, at which many matters relating to fruit growing were discussed, and particular attention was paid to the insect pests occurring in the Kootenays and those which it was thought might possibly be introduced. Mr. Anderson detected the Codling Moth at Nelson during this visit; so, special attention was given to it, and the proper steps to control it were explained.

August 23: Indian Head.—Visiting the Experimental Farm and farms in the neighbourhood with Mr. Angus Mackay, the Superintendent of the Experimental Farm.

October 31-November 1: Guelph, Ont.—The annual meeting of the Entomological Society of Ontario. Presidential Address: 'The Entomological Outlook.' 'The Entomological Record, 1907.'

November 15: Toronto.—Annual convention of the Ontario Vegetable Growers' Association. Address: 'Insects that trouble vegetable growers and how to combat them.'

December 10.—Macdonald College, Ste. Anne de Bellevue, Que.—Meeting of the

Pomological and Fruit Growing Society of the Province of Quebec. Address: 'Insects injurious to fruit and vegetable crops in Quebec province during 1907.'

December 26 to January 3: Chicago, Ill.—Attending the meeting of the American Association for the Advancement of Science; the Association for the Advancement of Agricultural Science; the Entomological Society of America, and the Association of Economic Entomologists.

February 4: Ottawa.—Canadian Seed-Growers' Association. Address: 'The place of the Canadian Seed Growers' Association in the campaign against farm weeds.'

Mr. Gibson also attended the annual meeting of the Entomological Society at Guelph, and took an active part in the proceedings, giving in the various discussions much useful information, which was very acceptable to the meeting. Mr. Gibson also read a paper on 'An unusual outbreak of Halisidota Caterpillars.'

Acknowledgments.—It is again my pleasant duty to gratefully acknowledge my obligations to my many correspondents in all parts of the Dominion, to practical farmers who have much aided the work of the Division by promptly reporting outbreaks of injurious insects and noxious weeds, by sending specimens for examination and for our collections, and also by making observations upon points of special interest. My thanks are also specially due to many eminent specialists who have helped by giving us the exact identifications of specimens of plants and insects which were unknown to us. Among these, special mention may be made of the following:—

Prof. John Macoun, of Ottawa; Prof. W. G. Farlow, of Harvard University; Prof. L. R. Jones, of Vermont; Dr. P. A. Rydberg, of New York, and Dr. William Trelease, of St. Louis, for giving me their opinion on some doubtful plants.

Dr. L. O. Howard, Chief of the Bureau of Entomology, Washington, U.S., and the specialists on his staff, for the identification of insects in little known orders.

Dr. J. B. Smith, New Brunswick, N.J., who has examined and reported upon hundreds of noctuids and other moths for this Division and for Canadian collectors.

Mr. W. D. Kearfott, of Montclair, N.J., who has been of great service in naming microlepidoptera.

Mr. W. H. Harrington, Ottawa, for identifying coleoptera and hymenoptera.

Dr. E. M. Walker, Toronto, for examining and reporting upon many specimens of Canadian odonata and orthoptera.

Sir George Hampson, Bart., of the British Museum, has kindly examined several specimens and compared them with the series in the British Museum, not only for this office but for many other Canadian students.

In conclusion, I have again much pleasure in acknowledging publicly the good work which is being done by my assistants, Messrs. J. A. Guignard, Arthur Gibson and J. Létourneau.

I have the honour to be, sir,

Your obedient servant,

JAMES FLETCHER,

Entomologist and Botanist.

DIVISION OF ENTOMOLOGY

CEREALS.

The season of 1907 in all parts of the Dominion will long be remembered for its unusual and irregular character. From the Atlantic to the Pacific the spring was cold, dry and very late. Insects of all kinds were exceptionally scarce and the paucity of insect life in April and May had a direct effect on bird life as well as in many places also upon fruit crops. The amount of fruit set was noticeably smaller where there were no colonies of bees kept in the vicinity. The exceptionally backward nature of the season continued throughout the summer and affected seriously the development and ripening of all crops. This was only partially compensated for by a long open autumn without severe frosts. In the wheat-growing districts the crop was, however, in many places injured by this exceptional season and this was particularly the case in the prairie provinces.

The grain crops in the Northwest provinces were poor and light in quantity owing to the very unusual season, but the much higher price paid for grain than in previous years brought much money into the country and relieved the farmers from much of their loss. In British Columbia very little spring wheat was grown owing to the presence in previous recent years of Wheat Midge. Fall wheat yielded fairly well.

THE HESSIAN FLY, *Mayetiola* (*Cecidomyia*) *destructor*, Say, occurred in the Maritime Provinces in several localities, but only in Prince Edward Island was noticeable injury reported. There is evidence that this troublesome insect is again gradually increasing in Ontario, and as it is working westward in the northwestern United States it must at some time be expected to appear in our Alberta fall-wheat districts; it will be well therefore for farmers to be on the alert and apply vigorously the well known remedies which, briefly, are as follows—

Late Sowing of Fall Wheat.—This is the most important preventive remedy and means a change from the ordinary farming practice and for this reason it is sometimes rather difficult to persuade wheat growers to adopt it. By postponing seeding until the end of September the appearance of the young wheat plants above the ground in autumn is delayed until after the egg-laying flies, which emerge in August and September are dead. The chief objection offered to sowing so late as the end of September is that plants have not time to make vigorous roots so as to withstand the cold of winter. This danger, however, experiment has shown is not so great as it appears, and if the land is got into good condition and good heavy seed is sown by the end of September, it will generally give a satisfactory crop.

Burning Refuse.—Many of the flax-seed-like pupæ of the summer brood are carried with the straw and at threshing time are loosened and fall beneath the machine with the rubbish, or they may be left in the straw. All dust and screenings therefore from the threshing mill should be carefully destroyed or fed, and all straw and small seeds should be either used during the winter or burnt before spring.

Treatment of Stubble.—Most of the flax-seeds of the summer brood are placed so low on the stems that they are left in the stubble when the wheat is cut. A large proportion of these produce flies in September but some pass the winter in the stubble. Stubble should therefore be ploughed down deeply so as to place the insects so far beneath the surface that the delicate flies when they emerge cannot escape.

Trap Crops.—A method of reducing the numbers of Hessian Flies which is little practised, but which is spoken highly of by some, is sowing narrow strips of wheat in

August, which will attract the females to lay their eggs; these strips must afterwards be ploughed down before the larvæ are mature when they will be killed, and the wheat which is sown late will escape owing to the egg laying females having all deposited their eggs. This end may also be obtained by running a harrow over the stubble as soon as the crop of fall wheat is cut so as to start a volunteer crop from the grain which had been shelled out in harvesting. This volunteer crop will form an attraction to the females before the main crop appears above the ground and can be ploughed down deeply at any time before the larvæ mature.

Reports of injuries by Hessian Fly from Manitoba proved upon investigation to be unfounded.

WHEAT-STEM SAWFLY, *Cephus occidentalis,* Riley & Marlatt.—This insect which has been referred to occasionally in previous reports of the Division, last autumn appeared in central Manitoba and the eastern part of Saskatchewan, in much more serious numbers than at any previous time. The broken down straws which resulted from its attacks were seen in many fields and caused some alarm. Among correspondents who reported on this insect, Mr. Norman Criddle, an observant farmer and student of insects, living at Aweme, Manitoba, writes at the end of the season as follows:—

'This native species of sawfly which until the breaking up and cultivation of the prairies was confined to a few native grasses belonging to the genus *Agropyrum,* of which *A. caninum,* R. & S. here is the favourite, has increased considerably during the last year or two. In the absence of parasites this insect seems to have been controlled by the number of flowering stems formed by its food plant, the grass in its turn being restricted by the climatic conditions of the season, so that an unfavourable season for the grass to form flowering stems would also prove unfavourable to the increase of the sawfly; but with the cultivation of the prairie and the planting of cereals the conditions change. For, although native grasses seem still to be preferred, yet if on account of the season, as is sometimes the case, they fail to develop stems abundantly or the insects are too numerous for the stems of the grasses produced, the flies turn their attention to wheat or rye, as well as to the western rye grass, *Agropyrum tenerum,* Vasey, which is now so extensively grown in Manitoba, causing serious damage to that important crop. These conditions occurred in 1907 with the results that in some cases fully 50 per cent of the wheat stems were broken down around the edges of fields, extending in to a distance of 100 feet or more, and damage was apparent to a lesser extent all through the crop. An interesting feature in connection with this attack upon wheat, was that fully 75 per cent of the infested stems were broken down by wind about 2 or 3 inches above the ground, close to where the larvæ were at work; and in many instances an examination showed that the larvæ had been caught by the breaking of the straw, some actually at the broken spot, when they were pinched to death, while in others they were above the break, which proved equally fatal to them. I calculated that on a certain area fully 12 per cent were killed in this manner. It is interesting to note that the native grasses, however, never break in this way, so that in attacking wheat the insect has to contend with conditions which, though favourable to its increase, are not so much so as an abundance of its native food plant would be. The life history, so far as I know it, seems to be about as follows:—The eggs are laid singly upon a stem of grass or wheat, not far from the head, between June 20 and the second week of July. The larvæ soon hatch and begin to eat down inside the stem, usually reaching maturity and the ground towards the end of August. They then eat the stems almost through, slightly below the ground, so that they break off. The stubs are then closed over with a water-tight material and the insides of the stems are also lined by the larvæ to the roots. In these retreats the larvæ pass the winter and remain in an active condition unchanged until May of the following year, when they turn to pupæ and emerge as perfect sawflies towards the end of June, the date varying somewhat with the season.'

In my previous reports from observations I had made on material sent to me I had suggested that an important remedy in controlling this insect would be the burning over of stubbles, but from Mr. Criddle's observations it would appear that the winter location of this insect below the surface of the ground would protect it so thoroughly as to render this practice almost useless. At my request Mr. Criddle made special observations on this point. He writes:—

'Aweme, October 6, 1907.—At your suggestion I have just made experiments with burning stubble to see what its effect would be upon *Cephus occidentalis*. As the stubble was too thin to burn freely, and to make sure of having the experiment complete, I spread an infested piece of ground with four inches of straw and then set fire to it. This burnt decidedly longer than the thickest stubble would do and heated the ground on the top, so that it was unbearable to the hand. After it was cool I examined the inhabited straws, and though in some cases the top of the stubble cut off by the larvæ had been burnt, in no instance was a single larva found injured, but in every case they were found at the extremity of their burrows near the roots of the plants, showing that the heat had merely had the effect of driving them downwards, and as their tunnels in the straw usually extend from one to two inches below the surface, they would practically be uninjured by this treatment.'

The Wheat-stem Sawfly undoubtedly occurs in many places where its presence is overlooked, but correspondents in Manitoba and the Northwest make frequent reference to an injury in wheat fields which can only be referred to this insect. The remedy which suggests itself and which has been practised to some extent is the ploughing down of all stubbles either in autumn or before June 15, at which time the mature insects may be expected to emerge. Mr. Criddle also suggests that all grasses belonging to the genus *Agropyrum* growing around the edges of fields should be mowed down during the last two weeks of July, so as to destroy any contained larvæ.

Wheat Joint Worm, *Isosoma tritici*, Fitch.—There is every year considerable loss in the wheat crop of Prince Edward Island from the Wheat Joint Worm, and some correspondents believe that the insect is spreading quickly throughout the province. Father Burke, of Alberton, who has many opportunities of examining the crops, believes it to be a serious matter, and regrets that more of the farmers do not consider it specially with a view to adopting concerted measures for its control. The adoption of a regular short rotation of crops and the mowing down of all grasses along the borders of fields in June, as well as the keeping up of the fertility of the soil, so as to produce a healthy vigorous growth, will not only discourage egg-laying by the Joint Worm but will have many other beneficial effects on the land where these wise measures are practised.

'Lower Montague, P.E.I., July 30.—I send you a few stalks of Laurel wheat. This crop was sown on May 19, and appeared to be all right and looked splendid until lately. On examining it I find a great many crooked straws similar to those which I send. I have never seen this before. I have a field of White Fife wheat which was sown on the same day as the Laurel, and this is very little affected.—MONTAGUE ANNEAR.'

'Stanley Bridge, P.E.I., August 3.—The Joint Worm has totally destroyed all the wheat in this vicinity and is spreading rapidly. As yet farmers have made no effort to fight the pest. Will it take oats and barley if we give up growing wheat?—A. J. MCNEILL.'

'Bay View, P.E.I., March, 1908.—In reply to your question, the Joint Worm of wheat was first observed in our district in northwest Queen's county, at Long River, about five years ago. The next season it had spread five miles along the shore. The remedies recommended were not applied, as the farmers on the Island seed down all their wheat land with clover and grasses, and firing the stubble would destroy their hay crop. In 1907 the pest had spread from Kensington along the shore to beyond Rustico, a distance of over thirty miles, and some nine miles inland. All wheat

seeded before June 3 was attacked, and practically all was ruined, and later seedings although free from the pest gave light crops of soft wheat. Parasites have not been observed as yet, and there seems to be a steady increase in the numbers of this very serious pest of our wheat crop. I may mention that I saw Joint Worm flies on the wing on May 23.—J. A. Clark.'

Specimens of the galls were sent from Prince Edward Island and such of the flies as were reared proved to be the Wheat Joint Worm, *Isosoma tritici,* Fitch, but from the difference in the appearance of the galls it would seem likely that another species was also at work on wheat in Prince Edward Island. No specimens of *Isosoma hordei,* Harris, were received, nor were there any complaints of injury by joint worms to barley. It is not likely that the Wheat Joint Worm will attack either barley or oats. There is apparently only one brood of the Wheat Joint Worm in Canada, the larvæ of which winter in the straw, for the most part so near to the ground that when the crop is cut the greater portion of them are left in the stubble. It has been recommended as a remedy for Joint Worms to burn over the stubble or to plough it down deeply for the destruction of the contained larvæ, and the disposal by burning or feeding of the galls or hardened portions of the straw which become separated in threshing. There is great variation in the extent of the swelling which results from the attacks of these larvæ. Frequently the galls are hardly noticeable, but the tissues of the stem are thickened and become brittle so that they break from the rest of the straw when threshed. These and all straw from an infested crop should be either fed or burnt before the ensuing spring. As is pointed out above by Mr. Clark, the farmers of Prince Edward Island are getting into the way of seeding down their wheat lands with clover and grasses, so that either burning of stubble or ploughing down cannot be adopted where the land is to be left in hay. A more extensive cultivation of clover than has been the practice in the past in Prince Edward Island is highly desirable, but while the Wheat Joint Worm is abundant and increasing in destructiveness, some modification of the ordinary practice is decidedly advisable and the benefit of sowing clover as a nitrogen-gatherer, might still be preserved to a large extent by sowing a few pounds of clover seed with all grain crops and then ploughing this down with the stubble either in the first autumn or the following year. In fighting against insects it frequently becomes advisable to modify accepted agricultural practices so as to control a pest which has become unusually abundant at a special locality. By examining the stubble of an infested crop of wheat it could soon be seen whether or not the galls were located near the base of the stem or so high up that they would be carried with the straw. The location of the gall will vary with the season in the same way that the point of attack by the Hessian Fly varies. In late cold springs the attacks of both of these insects are lower down, in the case of the Hessian Fly being sometimes entirely confined to the root shoots, while in other years the larvæ may be found one or two joints up the stem from the base.

It is important that the farmers of Prince Edward Island should now come together and discuss methods of prevention for this insect, so that some wholesale, vigorous and concerted action may be taken to prevent the further increase of this insect which is now becoming of importance to the whole Island.

The perfect insect of the Wheat Joint Worm is a minute, shining, black, four-winged fly, only one-tenth of an inch in length with clear wings and pale legs. The larvæ are slender, footless grubs, one-eighth of an inch long with perceptible brown jaws. These occur only inside the galls on the stem and vary in number from 4 or 5 to as many as a dozen in a single gall. The galls as a rule occur just above the first or second joint above the root. Nearly all of the larvæ winter unchanged inside the galls, but occasionally a small proportion change to flies and emerge late in autumn.

The Grain Aphis, *Macrosiphum granaria,* Kirby.—There was an unusual amount of interest and considerable alarm in the Northwestern provinces last summer concerning grain plant lice and several letters were received asking if specimens sent were the so-called 'Green Bug' which was causing such a great sensation in the

States to the south of our border. Actual specimens of this insect, *Toxoptera graminum,* Rond., were received from Emerson, Manitoba, but these had merely spread over the border from an infestation a few miles to the south in Minnesota and did no harm in our wheat fields. There were, however, serious complaints of injury in Manitoba and the eastern part of Saskatchewan from the ordinary Grain Aphis, *Macrosiphum granaria,* Kirby, a somewhat similar insect but one which is easily distinguished from it by the venation of the wings when examined under a magnifying glass. There are four plant lice which injure wheat in the west. (1) The Spring Grain Aphis, or so-called 'Green Bug' which for the most part attacks the leaves of the young plants, and which has the second vein from the tip of the upper wings only once forked or divided, and the small honey tubes at the end of the body above, of a pale colour with only the tips darkened. (2) The Grain Aphis, which has the second vein twice divided and the tubes black. (3) The Oat Grain Aphis, *Siphocoryne avenæ,* Fab., also called the European Grain Aphis, which in the winged form has the second vein forked, but instead of being divided at the tip so that the first fork from the tip leaves the main vein one-quarter of the way from the end, it is only about one-eighth of the distance, thus leaving the cell at the tip of this vein very small. The tubes at the end of the body are distinctly broader at the base than toward the apex. The eyes are reddish as in the Grain Aphis and the front of the head is not pointed in which it agrees also with the last named species. The two last named plant lice although they occur upon the leaves of the small grains during part of their life-history are much more apt to cluster together on the heads as soon as these are formed, while it is stated that the Spring Grain Aphis only attacks the leaves. Prof. Washburn states distinctly, 'Toxoptera was never found according to the reports of our field workers on the heads of any of its food plants, differing in this respect from *Macrosiphum granaria* which attacks the heads as soon as they appear.' (4) The Apple Aphis, *Aphis mali,* Fab. This species does not feed the whole season on the plants of the various small grains but migrates to them during the summer time from apple trees, the winter being passsed in the egg condition on the branches of apple trees in a similar way to that in which the Hop Aphis winters on plum trees. After four or five generations on apple trees in the spring, winged migrants are produced all of which fly to the grain fields and at once produce large numbers of wingless young, all of which are females. These towards the end of the season produce perfect males and females, which, after mating, deposit the winter eggs on apple trees.

The injuries by the Spring Grain Aphis have been more pronounced in the southern districts of the United States; but the species has spread northward in injurious numbers almost to our borders. The chief check on the excessive increase of this pest in the United States has been the sudden appearance in large numbers of a minute parasitic wasp, named *Lysiphlebus tritici,* Ashm., which not only destroys this grain aphis but also all other species found in grain crops. It is fortunately present in large numbers in all the districts from which grain plant lice were sent last summer. The injuries by the ordinary Grain Aphis, *M. granaria,* were in some places severe, being reported in July, August and September. These injuries were chiefly in the west.

'Welwyn, Sask., August 26.—I send specimens of a green aphis and some heads of wheat showing the way in which they feed. Seemingly they suck the sap out of the base of the grain where it is attached to the stem. Is this the same as the green bug they have in the Western States? They are doing the grain fearful damage, as they are in millions. So far I have only seen it on breaking. I have not heard of any other fields in this neighbourhood, and I only discovered them on my own three days ago.—RANALD STEWART.'

'Welwyn, September 10.—I send you some more wheat and bugs. I have found no parasites. The bugs are not as plentiful as they were three weeks ago and summer fallows seem to be free. I have just heard to-day that there are hundreds of acres about 30 miles northeast of here which are not worth cutting. Two farmers there

have 200 acres of wheat, and out of that they are only going to cut 35. I think the damage is more widespread than people have any idea of. I have put my own loss at 15 per cent of the crop and probably more, but we have had two heavy rains since these bugs appeared, and this seems to have washed many of them off.—RANALD STEWART.'

These specimens sent by Mr. Stewart were at first thought to be the dreaded 'Green Bug,' but winged specimens were afterwards received and they were found to be the Grain Aphis. Specimens of the same species were also sent from localities in Manitoba, mostly from the west of the province. Parasites were reared in numbers from all the material sent, including that from Welwyn.

Unfortunately for the Grain Aphis there is no practical remedy which can be applied in a wholesale manner, but Prof. F. M. Webster, who has devoted much attention to the insects which attack grain crops, has constantly drawn attention to the great advantage of practising good agricultural methods in working land, such as the adoption of a regular rotation of crops, so as to keep up the fertility of the soil, and advises that care should be taken to sow grain at the best time to secure a vigorous growth, which will enable the plants to withstand the attacks of the aphis sufficiently long to allow the natural parasites which always sooner or later appear, to increase, so that the numbers of the plant lice may be reduced before serious injury is done to the grain plants. In the case of the Oat Grain Aphis and the Apple Aphis, the two commonest species in Ontario and the east, as these pass the winter in the egg condition upon apple trees the regular spraying of apple orchards with kerosene emulsion or the lime and sulphur wash would not only clear those trees of enemies which sometimes do much harm but, also, to a large measure protect the wheat fields the following season. Fortunately for the wheat grower a severe outbreak of grain plant lice is almost invariably accompanied by a rapid increase in the numbers of various parasitic and predaceous enemies, which as a rule prevent serious losses.

GRASSHOPPERS, *Melanoplus* spp.—Locusts, or as they are more generally spoken of as grasshoppers, were injuriously abundant in some places in eastern Ontario and along the Quebec shore of the Ottawa river. A great amount of injury was done to pastures and all growing crops. Large swarms of the ordinary species which are common in Ontario also occurred in many places in western Ontario, where injury was done not only in field crops but in vineyards and orchards. The species sent in were *Melanoplus femur-rubrum*, DeG., *Melanoplus atlanis*, Riley, and *M. bivittatus*, Say. In Manitoba the same species were all present and destructive as well as *M. packardii*, Scudd., and *Camnula pellucida*, Scudd., was destructive in British Columbia. The following letters chosen from many received show the extent of injury by some of these swarms and the time they appeared:—

'Kamloops, B.C., May 31.—Please send the latest information on fighting grasshoppers. They took my crop last year and are now hatching in great numbers. I have just put out Paris green and salt mixed with horse manure and a little water. My neighbours have tried this also, but they tell me the grasshoppers will not eat it.—J. P. SHANNON.'

'Treesbank, Man., August 16.—Grasshoppers are decidedly on the increase again, and with favourable conditions I fear that they might be as bad as ever in a year or two. We shall, however, watch them and try and put out the poisoned horse manure if they attack the crop.—N. CRIDDLE.'

'Neepawa, Man., September 7.—I send specimens of grasshoppers which are most unusually numerous this fall in this vicinity. They were never seen so thick before. I am wondering if they are the forerunners of a grasshopper plague next summer. Is there any danger from their laying eggs which will hatch next spring? If so what is the best thing to do?—E. T. MOODY.'

The species sent by Mr. Moody was the Two-striped Grasshopper, a large heavy species, which as a rule is found in rather low ground near bushes, and is not so often injurious to crops as some of the smaller and more active species.

'Pointe du Lac, Que.—I send specimens of grasshoppers which are actually destroying the crops in our district. We have tried the Criddle mixture, but it has not had an appreciable effect on their numbers.—Rev. J. Caron.'

'Galetta, Ont., July 17.—Please give a remedy for grasshoppers. A very large army of them has attacked a field of oats having come from a large adjoining pasture. I have tried Paris green on a ridge without effect.—Matthew Riddell.'

'Ballantrae, Ont., Aug. 22.—Seeing that various reports are going in with regard to the grasshopper plague I thought I would tell you how we were faring in this part of the province. I live on the ridges of the township of Whitchurch, county of York, and our soil here for the most part is a sandy loam. The grasshoppers struck this locality early in the season and we are suffering greatly from their ravages. Other localities escaped until later in the season, but they are becoming general and widespread now. They have taken all second crop and spring-seeded clovers. Pasture land is as bare and brown as a barn floor. Some farmers left their oats standing until completely stripped, others cut them in the milk, and they were half stripped even at that stage. The turnip crop is practically gone. In some cases the carrot crop is eaten level with the ground and their latest freak is eating out the mangel roots. Peas have escaped fairly well but some fields are nearly stripped of their foliage. Fodder corn is eaten in holes and they are boring through the husks and eating out the grain of the ear. They started about a week ago upon the potatoes and some patches are now bare. They cut the leaves off and drop them and the stalk is sometimes eaten through at the bottom and just falls over and dries up. Vegetables are entirely destroyed and raspberry, gooseberry and currant bushes are stripped bare. —W. A. Quantz.'

Last summer was extremely dry in many localities and where this was the case growth was slow and meagre and here the grasshoppers did most harm. In some places where copious rains came late in the season and vegetation of all kinds picked up the injuries by grasshoppers were much less apparent. Rev. Father Caron when writing in the middle of August from Point du Lac, Que., refers to this and speaks of his previously reported poor effects of the Criddle mixture of Paris green and horse manure in his parish, which he says the farmers did not use sufficiently to give it a fair trial because it did not show immediate results. This was the case also in many other places where the mixture was tried. There is evidence to show, however, that this mixture which undoubtedly gave most satisfactory results in Manitoba wherever it was tried has not proved so successful in some other places. Whether this is due to the climatic conditions I am unable to say, but in Manitoba the grasshoppers were destroyed in myriads and the mixture was remarkably attractive to them, so that they would flock to those parts of the field where it had been scattered and were poisoned by eating it. In Ontario on the other hand it would seem to be much less attractive to the species which occur commonly here. For these districts it may be remembered that the now well known poisoned bran remedy for cutworms (one pound of Paris green, one pound of salt and one gallon of water, in 100 pounds of bran) may be used and is extremely effective against grasshoppers of all kinds. In fact this mixture of Paris green and bran was originally devised in California as a remedy against grasshoppers in vineyards. The spraying of the edges of fields with arsenical mixtures when grasshoppers first begin to move towards crops has also been found very useful. Later when the insects have their wings and are occurring in large numbers a modification of the tin pans or light frame works known in the west as 'hopper-dozers,' may be used to great advantage. These are light frames with wings and a back covered with canvas and having a tin pan at the bottom which will hold tar or coal oil and water. These are drawn over pastures or in such places as grasshoppers are abundant and the insects are caught in large numbers. If a grasshopper has only a small drop of coal oil on its body it will soon spread all over it and be fatal.

Pea Weevil, *Bruchus pisorum*, L.—The Pea Weevil which for three years has hardly been mentioned in correspondence, is evidently again increasing in numbers

and it is of the greatest importance that pea growers and seed merchants should use vigorously the well-known remedy of fumigating all seed peas before sowing them, or, what is far preferable, as soon as they are harvested and threshed. One or two samples have been recently sent in which were as badly infested by the Pea Weevil as in the worst years four or five years ago. One of the important centres of the pea-seed trade is the county of Prince Edward in Ontario. A few years ago peas in that county were infested by the Pea Weevil to an extreme degree. Mr. J. D. Evans, of Trenton, who has kindly kept me informed regularly with regard to this infestation, reports on the season of 1907, as follows: 'I discusssed the matter of Pea Weevil injury with Mr. W. P. Niles, of Wellington, one of our best authorities, and he tells me that the Weevil is almost extinct in Prince Edward county at the present time, but owing to the carelessness of farmers in attending to their seed peas, he will not be at all surprised to see it again troublesome in the near future.' Mr. Niles said that he had received some peas from Oshawa which were somewhat infested but not very seriously; but he had, however, a sample from Exeter, in Lambton county, which was about as bad as it could be. The remedy above all others by which the Pea Weevil has been kept in check in the past is the scrupulous fumigation of all seed peas. There is still some confusion on the part of farmers as to what the Pea Weevil really is. This is to a measure due to the senseless persistence of merchants and farmers in speaking of it as the 'Pea Bug' and consequently as almost every insect is called a bug on this continent, as many specimens of peas injured by the Pea Moth are sent in as having been attacked by the Pea Weevil, as those injured by the insect properly so called. The injuries of these two insects are entirely different. The work of the Pea Weevil is inside the seed and after the small brownish gray beetles, one-fifth of an inch long and bearing two conspicuous black spots on the end of the body, have emerged, there is on the side of the pea a small perfectly round hole. The work of the caterpillar of the Pea Moth is an irregular ragged-edged cavity eaten in the side of the seed while it is green. The life-history of both of these insects is perfectly well known: The egg of the Pea Weevil is laid on the outside of the young green pod and the grub on hatching eats its way in and penetrates the nearest pea. Here it remains until full grown which is late in the summer time after the peas are ripe. When peas are threshed as soon as they are ripe and the seed is fumigated at once the grub of the Pea Weevil can be destroyed before it has eaten very much of the seed; but if left untreated until later in the winter or until just before sowing, the benefit is merely that the beetles inside the peas are killed. This is of much importance but if the work is done as soon after harvesting as possible the injury to the seed is reduced very much indeed. The larval life of a Pea Weevil is passed entirely inside the pea it first entered. The egg is laid during June and the small grub has to penetrate the pod and locate itself inside a seed before this becomes too hard. The development from a white fleshy grub to the pupal condition and the change to the perfect beetle, all take place during the late summer and some of the beetles are fully developed by about the middle of August, a few, in certain seasons, leave the peas in the autumn or even as early as harvest time; but the regular habit of the insect is for the beetles to remain in the seed until the following spring. Those weevils which emerge in the autumn pass the winter hidden away under rubbish or in barns, outhouses, &c. Occasionally there is a wholesale emergence in the autumn, and when this takes place the numbers of Pea Weevil are enormously reduced. They are exposed to many dangers which they would have escaped had they remained inside the peas. Insect eating birds and mammals destroy many, and I have been shown, near Picton, in Prince Edward county, Ont., thousands of the beetles which had crawled beneath the shingles of an old barn and had died there, presumably killed by the cold of winter. Those weevils which pass the winter safely outside, or those which have been sown in the spring with the seed peas, fly to the fields, and for some time feed on the foliage of the pea plants. As soon as the young green pods are formed the eggs are laid and the grubs hatch soon afterwards. There is only one brood of this insect in

the year, and the important fact in its life-history is that every pea containing a weevil, and this is by far the largest proportion of all the insects produced every year, is for a considerable time entirely at the mercy of the farmer or seed merchant, for there is no other known food plant for this insect than the cultivated pea. It is not a native of this country any more than its food plant is, and the pea is not one of those cultivated crops of which the seeds lie over and produce a volunteer crop the following year.

Remedies.—(1) Holding over seed. Of many remedies suggested that of easiest application and requiring no expenditure is the holding over of seed. Where only a few seed peas are used it is very easy to store these away until the second year after harvesting. Peas should always be bagged and the sacks tied up tightly at once after threshing. It has been found that the Pea Weevil cannot eat its way through bags even when these are made of paper. Therefore all the weevils which emerge either in autumn or the following summer will die inside the bags, and the seed can be sown the following year without danger. Sound seed will not be injured in the least by being held over for this time. Seeds which have been injured by the weevils will grow unless the germ has been destroyed, but such seeds produce only weak plants, which unless all conditions are extremely favourable, do not produce nearly as heavy a crop and should not be used for seed unless no others are obtainable. Of 400 seeds picked at random from a sample sent in last winter, all of which had been attacked by the weevil, only 34 grew:

a. 10 seeds germinated, 3 weak plants, 7 strong.
b. 9 seeds germinated, 2 weak plants, 7 strong.
c. 10 seeds germinated, 4 weak plants, 6 strong.
d. 5 seeds germinated, 3 weak plants, 2 strong.

This experiment merely confirms previous experiments which have been tried here on several occasions.

(2) Fumigation.—The standard remedy upon which chief reliance must be placed to control the Pea Weevil is the fumigation of all seed peas with bisulphide of carbon. For treating large quantities, specially prepared houses are maintained by the large seed merchants. These 'bug houses' are tightly constructed, and are made to treat from 1,000 to 3,000 bushels at a time. The treatment of smaller quantities, such as are required by farmers, is an easy matter, and an ordinary coal oil barrel is a convenient receptacle for the seed. A 40-gallon coal oil barrel will hold about five bushels, or 300 pounds of seed, which can be treated with 3 ounces of bisulphide of carbon poured right on to the peas and the barrel quickly closed up tightly. The bisulphide of carbon should be of the best quality which will vaporize entirely without leaving any residue. The time to keep the barrel closed is 48 hours. As stated above, the seed should be fumigated as soon as possible after harvest, but the work may be done at any time when the temperature is above freezing. It is well to mention that bisulphide of carbon is very inflammable; fumigating therefore should be done out of doors in a shed or at a distance from buildings, and no light of any kind must be brought near.

FRUIT CROPS.

The spring of 1907 was cold throughout the Dominion and very dry in the eastern provinces. This had a direct effect upon all fruit crops. The remarkable scarcity of insects of all kinds prevented the fertilization of much fruit, except in such orchards as were near to apiaries. The crop in Ontario, Quebec and the Maritime Provinces was not of very high quality, but good prices were obtained, particularly when grown under the best horticultural methods. At the Central Experimental Farm there was a full set of fruit owing to the number of bees which had access to the bloom. Prof. Hutt, of the Ontario Agricultural College at Guelph, drew particular

attention to this matter also at the last annual meeting of the Entomological Society of Ontario. Bees wintered poorly and many colonies were weak in spring. Prof. Hutt attributes the small set of fruit in some localities in Ontario in 1907, chiefly to the lack of domestic and wild bees, and noticed many instances where men who kept bees had better crops of fruit. In British Columbia the fruit crop was excellent and as good in quality as in quantity. In western Ontario the crop of grapes was large except in those districts where the Rose Chafer destroyed the blossoms. wing to the late cold season many kinds of grapes were not ripe when the frosts came. Small fruits produced poor crops owing largely to the drought. The crops of vegetables of all kinds were also much affected by the drought, and in the eastern portions of the province of Ontario and in parts of Quebec the potato crop was exceptionally poor. In some places the seed tuber remained in the ground without decaying until the end of the season.

Codling Moth, *Carpocapsa pomonella*, L.—Of the insect enemies of fruit crops some of the old enemies and well known pests were more than usually destructive. The Codling Moth in western Ontario was so destructive in some places that several fruit growers discussed seriously the advisability of cutting down their apple trees and planting grapes or peaches. This part of the province is within the area where there are two regular broods of the Codling Moth in the season, the latter of which is by far the more destructive. It therefore becomes necessary for fruit growers not only to spray their trees in spring but also to apply bands regularly as shelters for the larvæ to spin up in. This causes a great deal of work, and in this district grapes and peaches are considered the best paying crops. This fact I believe accounts to a large measure for the increase of the Codling Moth in the Niagara peninsula. The apple orchards are not given the same care as in other parts of the province and consequently some of the regular pests increase unduly. In this district three sprayings with poisoned Bordeaux mixture in spring and the banding of all trees in July and August are the means by which the apple, pear and quince crops should be protected from injury by the Codling Moth. Some care is necessary in attending to the bandages, or putting them on may do more harm than good. These bandages may be made of any soft material such as burlap, hessian, old sacking, &c., and can be quickly and easily attached to the trees by placing a piece of string or wire around the middle and then turning down the upper half. These bands should be put on the trees by the beginning of July and should be examined at least once a week for the rest of the season. During August a great many cocoons and larvæ will be found and these must be destroyed, for which purpose it will be necessary to remove the bandages. Later in the season the caterpillars will be fewer and the easiest way of killing them is with the point of a knife without removing the bandages. The caterpillars have the habit of boring some distance into the bark of the tree and spinning in the dust on the outside of their cocoons. This renders them extremely difficult to detect and I have found a convenient implement for cleaning the bark beneath the bandages is a wire brush such as is used for cleaning out furnaces. This tears the cocoons from the bark and destroys the contained larvæ.

A fact which is always apparent in orchards which are regularly sprayed year after year with poisoned Bordeaux mixture is that the effects are cumulative. Regularly sprayed orchards gradually become year by year freer from insects and fungous enemies, notwithstanding the fact that many insects are able to fly long distances and the spores of parasitic fungi may be borne easily almost to any distance.

The Oyster-shell Scale, *Lepidosaphes ulmi*, L.—Owing possibly to the inclement season the increase of the Oyster-shell Scale in the summer of 1907 was particularly noticeable and undoubtedly much injury resulted from its attacks upon fruit and other trees. The young of this insect hatch beneath the parent scale about the end of May or the beginning of June and are active for a few days only. They are then

very minute, six-legged mite-like insects which swarm over the trees giving them the appearance of having been dusted with some coarse white powder. By the second day most of the young scale insects have chosen a suitable place and have attached themselves to the young tender bark by means of their slender sucking tubes. There they remain for the rest of their lives, growing rapidly during June and July. Early in August the females have become little more than a bag of eggs beneath the waxy scale. The insect itself is crowded up into the narrow end of the scale where it dies, leaving the eggs to carry the species over the winter. The scales of the male are seldom noticed; they are most frequently found upon the leaves and are of an entirely different shape from those of the female, being elongated, square at the end and somewhat tapering to the front. They are very small not more than one-twentieth of an inch in length and pale in colour. Unlike the female which lives all its life inside the scale and has no power of motion after it once settles, the male is a minute two-winged fly which when mature emerges from beneath its scale and has the power of flying very rapidly.

Remedies.—The remedies for the Oyster-shell Scale are the invigoration of the tree by high culture and good orchard management and the direct treatment of the scale insects with contact insecticides. The young hatch about the beginning of June and as soon as these are noticed on the trees, whale oil soap solution, or kerosene emulsion, should be promptly applied as a spray. The sooner this is done after hatching has taken place the more effective it will be. Trees badly infested should be helped by having some quick-acting fertilizer spudded in around their roots in spring and in autumn should be sprayed with a lime wash made of one pound of quick lime in each gallon of water. Two applications of this weak whitewash should be made and the second one may be put on immediately the first one is dry. This spraying should be done as soon as the leaves fall or at any other convenient time afterwards before the intense weather of winter sets in. During the winter the lime flakes off and carries with it a large proportion of the egg-containing scales which have been loosened by the lime.

THE SAN JOSÉ SCALE, *Aspidiotus perniciosus*, Cmstk.—The condition of affairs with regard to the San José Scale in the orchards of Ontario is practically the same this year as it has been for the last year or two. This insect although it has spread to new orchards has not invaded new territory in the province. Owing to the late season of 1907 the appearance of the young was also later than usual and there is no doubt that the fruit growers of that part of Ontario where the scale occurs, now understand its habits and the importance of using the lime and sulphur wash which is the standard remedy. Mr. J. Fred. Smith, the San José Scale inspector for the province of Ontario, reports that never before has there been so much done for the destruction of the scale by fruit growers as during the past season. The lime and sulphur wash was the remedy mostly used. Mr. W. H. Bunting, a large fruit grower and a leading member of the Fruit Growers' Association of Ontario, stated in a lecture given at Ottawa last winter that he considered the advent of the San José Scale into the orchards of Ontario, although it had done an enormous amount of injury, had really been a blessing to fruit growers, because with the lime and sulphur wash if properly applied, they now knew they could control this insect and the work which had been necessary owing to its presence had placed their orchards in a far better condition than they would have been had the scale never invaded the province. Systematic spraying had become a necessity and with its practice many of the regular enemies of the orchard had disappeared. The general condition of these orchards, he believed, was now greatly improved. Many different materials have been experimented with as remedies but up to the present time nothing better than the lime-sulphur wash has been discovered and fruit growers will be wise to recognize this as the standard remedy for the treatment of their orchards and leave experimenting with new materials

to the professional entomologists who always try these newly suggested remedies, and, it may be added, have in the past found most of them of little value.

There is much inquiry every year for the regulations under which the government permits nursery stock to be imported into Canada and also with regard to the formula used for destroying the scale on trees which are imported. In the first place it may be stated that the sole purpose of the government federal fumigation houses is for the cleansing of the stock from the San José Scale, and there is no legislation whatever of the same nature against any other insects. This statement is called for by persistent misrepresentations which are made in British Columbia. In that province the government officials condemn and frequently destroy nursery stock upon which they find several other insects besides the San José Scale; but the only one against which at the present time any federal legislation has been enacted is the San José Scale.

The formula used.—The formula used at the federal fumigating stations is one ounce of cyanide of potassium (98 per cent), one ounce of commercial sulphuric acid (60° Baumé), and three ounces of water, for every 100 cubic feet of space, and all nursery stock is exposed to the gas generated by this mixture for 45 minutes. This formula generates sufficient hydrocyanic acid gas of a strength requisite to kill every scale insect upon the trees in the 45 minutes during which stock is exposed to it.

Fumigating Stations.—There are six points only along the border at which nursery stock can be imported into Canada. At those points the federal government maintains houses for the fumigation of all nursery stock coming into the country from other countries known to be infested by the San José Scale. These are as follows: Vancouver, B.C.; Winnipeg, Man.; Windsor, Ont.; Niagara Falls, Ont.; St. John's, Que.; St. John, N.B.

The federal fumigation houses are kept open, with a superintendent constantly in attendance, throughout the spring and autumn shipments of stock. The superintendents are all trained men, expert in examining stock, and in unpacking and repacking all packages which come into their hands. Up till the present time the superintendents at all of the stations have done their work carefully and well, and no well founded complaints as to carelessness or injury to stock have been received from importers, either with regard to the reasonable delay which must occur while stock is being treated or as to injury to trees during the necessary unpacking, handling and repacking. In every instance when complaints have been made a thorough investigation has been promptly instituted, and in every instance it has been satisfactory to report to the Honourable the Minister of Agriculture that any injury that trees suffered in transit could not be attributed to carelessness on the part of the superintendents.

The Customs regulations as now consolidated under the San José Scale Act read as follows:—

1. Under 'The San José Scale Act' the importation into Canada of any trees, shrubs, plants, vines, grafts, cuttings or buds, commonly called nursery stock, from any place to which the Act applies is prohibited, and 'any nursery stock so imported shall be forfeited to the Crown and may be destroyed, and any person importing nursery stock from any such country or place, or causing or permitting it to be so imported, shall be deemed to be guilty of an offence under section 6 of the Customs Tariff, 1897, and shall be liable to a penalty prescribed by that section.'

2. By an order in council approved March 18, 1898, the said Act prohibiting the importation of nursery stock is declared to apply to nursery stock from the following countries, viz.: United States of America, Australia, Japan, Hawaiian Islands.

3. By an order in council approved March 18, 1898, plants exempted from the operations of the above mentioned Act are as follows:—

(*a*) Greenhouse plants with the exception of roses (such as palms, ferns, orchids, cacti, chrysanthemums, azaleas, begonias and carnations, but not roses or any other woody plants).

(*b*) Herbaceous perennials (the tops of which die down in winter, such as perennial phlox, dielytra, peonies, perennial sunflowers, &c., and also strawberries).

(*c*) Herbaceous bedding plants (such as geraniums, coleuses, verbenas, pansies, &c.).

(*d*) All conifers.

(*e*) Bulbs and tubers (such as lilies, hyacinths, narcissi, and all other true bulbs, gladioli, caladium, irises, cannas, dahlias, &c.).

4. By an order in council approved April 25, 1900, permission is given for the importation of roses in leaf and in a growing condition which have been propagated under glass.

5. By an order in council approved January 5, 1901, nursery stock may be imported if fumigated at the following customs ports during the periods undermentioned, viz.:—

Winnipeg, Man., and St. John, N.B.—From March 15 to May 15 in spring, and October 7 to December 7 in autumn.

St. John's, Que., Niagara Falls, Ont., and Windsor, Ont.—From March 15 to May 15 in spring, and from September 26 to December 7 in autumn.

Vancouver, B.C.—From October 1 to May 1 of the following year.

Note specially, that,—(*k*) 'All shipments made in accordance with the above will be entirely at the risk of the shippers or consignees, the government assuming no risk whatever.

(*l*) Packages must be addressed so as to enter Canada at one of the above named ports of entry, and the route by which they will be shipped must be clearly stated on each package. The nursery stock will, however, be fumigated when transported via other ports to a fumigating station.

(*m*) Nursery stock imported by railway or vessel may be fumigated in bond while in transit, and after fumigation may be forwarded under customs manifests to a customs port of destination—the customs officer in such case to mark plainly on the manifests the word 'fumigated.'

(*n*) Collectors of customs at ports of fumigation are requested to co-operate with the railways and officials of the Agricultural Department in securing speedy fumigation of nursery stock in transit, and also to use their best endeavours to expedite the transit of such nursery stock.

6. By orders in council of March 23, 1901, and May 31, 1901, Dakota cottonwood, or 'Necklace poplar' (*Populus monolifera,* Ait.), may be admitted at the custom ports of Brandon and Winnipeg, Man., without fumigation.

IMPORTATIONS BY MAIL.

7. Nursery stock imported through the mails (by postal package or otherwise) is subject to the provisions of the San José Scale Act, and during the period allowed for fumigation customs officers are to send such nursery stock, after customs duty has been paid thereon, to the collector of customs at the nearest fumigation station, marked 'In bond for fumigation,' with post card advising that the parcel be fumigated and then returned by mail direct to the importer (giving his address) marked 'Duty paid.'

8. *Seizures.*—Customs officers are requested to strictly enforce the provisions of the law prohibiting the importation of nursery stock, and to seize all trees, shrubs, plants, vines, grafts, cuttings or buds, commonly called nursery stock, when imported from the countries above mentioned, in contravention of the aforesaid Act.

(Sgd.) JOHN McDOUGALD,
Commissioner.

Dipping of Nursery Stock.—The only safe remedy yet discovered, for the treatment of nursery stock for the destruction of San José Scale when nursery stock is being shipped from place to place, is fumigation with hydrocyanic acid gas. Many experiments have been tried with various washes for dipping nursery stock to obviate the expense and inconvenience of this operation but none of these have proved satisfactory, nor as good, all things considered, as the method of fumigation which has been adopted by this department. Experiments, however, are being constantly tried and if anything better is discovered it will be at once adopted. Nurserymen and fruit growers now know that no injury whatever is caused by the fumigation and it is now seldom advanced by shippers as was the case a few years ago as an excuse for bad packing and poor stock.

The San José Scale Act has now been in force for ten years having been passed on the 18th March, 1898. Since the fumigating houses were established in 1900 constant examination has been made of nursery stock which passed through the fumigating houses and on no occasion has a living scale been detected upon trees which have been treated by our superintendents. Many thousands of fruit trees and ornamental shrubs worth large sums of money have been imported by nurserymen and others in all parts of Canada, and although the scale can be killed with certainty, by fumigation in the way it is done in the federal fumigating houses, no injury whatever has been done to the stock by the treatment which it has received to free it from any possible presence of living scales.

In view of the above it may be justly claimed that the Honourable the Minister of Agriculture has taken every wise step to protect the fruit growers of Canada against a further introduction of this most serious enemy, and at the same time has done everything which was reasonably possible to protect the interests of nurserymen and others who wished to import stock from outside the Dominion. The methods adopted for the fumigation of stock are those which are most highly approved by experts and have been found perfectly effective in destroying any scales which occurred on nursery stock which was treated. The governments of Ontario and British Columbia have also adopted drastic measures to prevent the spread of the San José Scale from known points of infestation to new localities. At the present time after eleven years from its first appearance it may be said that the only place in Ontario where the scale now exists is the comparatively small area running from Essex county along the north of Lake Erie and extending to the county of Wentworth, west of Lake Ontario. In British Columbia the scale has been detected at two places, Kaslo and Spence's Bridge, but at the former of these the trees were carefully sprayed and since that time no further infestation has been detected. At Spence's Bridge the whole orchard was cut down. The San José Scale has never been found in the maritime provinces, the prairie provinces, the province of Quebec, nor in any other part of Ontario than that mentioned. As this insect seems to be able to thrive in all districts where the peach can be grown commercially it is most advisable that fruit growers in such districts should be on the alert to detect any strange scale insects upon their trees and have them examined by experts as soon as possible. Prompt attention at the beginning of an outbreak will frequently save great destruction of trees and crops and the expenditure of much money.

The Rose Chafer, *Macrodactylus subspinosus,* Fab.—Injuries to grapes, peaches and apples by the Rose Chafer are of yearly occurrence in the Niagara districts of Ontario, but during 1907 their depredations were so serious that in many vineyards the whole crop was destroyed and the large wine-making firm of Bright & Shirriff, who buy between two and three hundred tons of grapes in the immediate neighbourhood of their establishment at Niagara Falls South, could not last year buy locally nearly all the grapes they required and had to import them from other districts. Mr T. R. Stokes, secretary of the Board of Trade of Stamford township, and of Niagara Falls South, in writing on this subject, says:—

'Last year the Rose Bug destroyed grapes to the extent of $60,000 in Stamford alone, immense graperies of ten and fifteen acres not producing more than a ton or a ton and a half. More than this they ruined shrubs and flowers in the historic cemetery at Lundy's Lane and the flowers in the beautiful Fairview cemetery have been much injured. They destroy the petals, pistils and stamens of the flowers of the grape. They make their appearance at the same time as the first grape blossoms. They also riddle the leaves of strawberries, raspberries and many other plants. The beetles only last for about a month, but they do an immense amount of harm. They appear suddenly simply in billions, destroying all flowering plants. In 1907 they appeared a week before grapes bloomed. They ate off the cap of the bloom and tore open the blossom and ate out the centre. They also ate the leaves to a certain extent, but the great injury is to the flowers. These Rose Bugs also tear up and destroy entirely the flowers of any scented roses they can get at. They do not touch the unscented varieties such as the Prairie King and the Crimson Rambler. They destroy a large percentage of the raspberry crop by destroying the blooms. This is a very serious matter and I trust that you will be able to come and map out some line of action for fighting this pest.'

There is no doubt that the Rose Chafer is a very serious enemy of the fruit grower wherever it occurs, and sometimes, as last year in the Niagara Falls district, it does an enormous amount of harm by attacking the flowers and young fruits of grapes, peaches and apples. Unfortunately very little can be done to control it. It is known that it breeds in sandy land, and where this can be ploughed up either just before the insects emerge early in June or late in autumn, a certan amount of good can be done, but all efforts with a view to poisoning the beetles on the flowers have failed. Prof. F. M. Webster in 1899 reported to the Association of Economic Entomologists (Proc. 11th Annual Meeting, Bull. No. 20, U.S. Div. of Ent.), the first successful experiment in killing the beetles in a wholesale manner. He says, page 20: 'At last we have found out how to kill the Rose Chafer. In view of the fact that the digestive apparatus of this pest seems to be proof against the poisonous or caustic effects of most drugs, this seems an achievement. One-half pound of fish oil soap dissolved in a gallon of water and sprayed upon them will kill 95 per cent of the adults, the females being especially susceptible, if the suds is sprayed directly upon them Drenching their food plant does not seem to affect them in the least, even if one pound of soap is used to each gallon of water, so the question of protecting vineyards is yet unsolved. Rhubarb has been found to be a valuable bait plant, the bloom which appears about the time of that of the grape being especially attractive to the beetles, and while clustered on the blossoms they can be collected or sprayed with the fish oil soap mixture and killed. The stronger mixture mentioned above did not appear to affect the peach, while the weaker injures the leaves and young fruit of the grape to some extent.'

The old fashioned remedy of hand picking is of course of service, but is slow and expensive even when as at Niagara Falls South there is an abundant supply of cheap labour. The children and women of the village are utilized in picking the beetles from the blossoms of grapes, but it is very easy for them to do much harm at that time by rough handling. The beetles may also be jarred on to sheets or frames saturated with kerosene, but these methods are tedious and must be practiced daily in the early morning or in the evening. Useful mechanical appliances on the plan of a funnel or inverted umbrella with a bag or can containing kerosene at the bottom for collecting the beetles when jarred from the plants are referred to by Dr. F. H. Chittenden in a circular on this insect (No. 11, 2nd series, U.S. Div. of Ent.).

In view of the success obtained by Prof. Webster in spraying with whale oil soap, experiments should be tried as to the strength which may be used without injury to the grape blossoms. The numbers of the beetles which have appeared for the last two or three years in the vicinity of Niagara Falls South are simply incredible. The occurrences were fortunately very local, some vineyards having every blossom stripped,

while in others hardly any bunches of fruit had been injured. Mr. Stokes attributes this freedom from injury to the time at which the blossoms opened. If the fruit is set before the beetles appear they do not seem to be specially attracted. It is while the flowers are open and the perfume is given forth that they are attracted and do so much harm. Clover when in bloom is also a favourite food plant for the Rose Chafer. Mr. Geo. Green, of Niagara Falls South, showed me a field of clover close to his vineyard which was simply a seething mass of beetles, which were swarming over the blossoms in hundreds of thousands. Mr. Green attributed a fairly good crop of fruit in his vineyard to the greater attraction which the clover had been for the beetles at the time the grapes were in bloom.

The Rose Chafer is a dull, yellowish grey beetle about one-third of an inch long, tapering a little towards each end. Its long sprawling legs are reddish with the feet black and tipped with strong claws with which it hangs tightly to the flowers it is destroying. The eggs are laid beneath the surface of the ground by the females, which burrow down about two inches at the time they lay their eggs. Each female lays about thirty eggs which hatch in three weeks, and the young grubs feed on the roots of grasses and other plants within their reach. They become full grown in autumn and pass the winter in a cell deep beneath the surface. At the opening of spring the larvæ come up near the surface in the month of May and change to pupæ in small oval cells. In shape the larvæ and pupæ resemble those of the well known White Grub.

Dr. Chittenden points out the advantage of prompt action in the collecting of the beetles or destroying them with contact sprays, immediately on their first appearance, and advises that all land which might serve as a breeding place should be ploughed and harrowed in May for the destruction of the pupæ. The least amount possible of light sandy land should be left in sod.

There are many brands of whale oil soap in the market. Those which are made with potash are considered the best and most convenient to use for the destruction of insects. That used by Prof. Webster was made by W. H. Owen, of Port Clinton, Ohio, and costs about 4½ cents a pound by the 100-pound keg.

THE *BROWN-TAIL MOTH*, *Euproctis chrysorrhœa*, L.—There has been considerable correspondence again during the past season with regard to the infestation of the Nova Scotian orchards by the Brown-tail Moth. The matter has been taken up energetically by Prof. Cumming, Secretary of Agriculture for Nova Scotia, who made use of the school children in the public schools in an effort to destroy all of the winter colonies of the caterpillars. A bounty of ten cents per nest was paid and these were sent in and identified by stated qualified officials and about 3,500 nests were passed as being those of the caterpillars of the Brown-tail Moth. Most of these were collected in a small isolated area near Bear River, N.S., where little work had been done the previous year. In those districts where operations were carried on last year, although a very much larger area was covered, not more than 200 nests were found. Prof. Cumming and Profs. Smith and Shaw, of the Agricultural College staff at Truro, N.S., have also been studying the matter carefully during the summer and arrangements were made for qualified men to go through the infested areas right up to the end of the season. Prof. Shaw thinks that the orchards of King's county, one of the infested districts, are absolutely clear of the pest and he does not know of any having been found in the forests adjacent. In Digby county also only four Brown-tail Moth nests had been found up till December 6 last, by five inspectors who the previous spring had found the nests exceedingly numerous in the same county. At the end of the winter season Prof. Shaw writes:—

'There have been about 15,000 specimens of insects sent in to Principal Cumming by the school children who have been collecting the Brown-tail Moth winter nests. Of these, 3,500 were of the Brown-tail Moth and these were found chiefly at Bear River and Smith's Cove, Digby county.'

The above reports are very satisfactory and the fruit growers of Nova Scotia are to be congratulated on the energy which has been shown by the above officials who have recognized the importance of this infestation and have acted promptly and energetically. It must be remembered, however, that the insect had become widely spread through the orchards of the province, that many of these are thickly planted and closely surrounded by forests or strips of wild native trees, and that this is a very difficult insect to control. It is almost too much to hope that the Brown-tail Moth can have been exterminated even by the energetic efforts which have been directed against it and every fruit grower in the provinces of Nova Scotia and New Brunswick should promptly send either to Prof. Cumming at Truro, or to this Division, specimens of any strange caterpillars they may find on their trees and particularly when these are occurring in large numbers during the summer, or gathered together in nests composed of leaves spun together with silk during the winter months. The only kind of caterpillar which is likely to be found in colonies inside such nests, is that of the Brown-tail Moth. These pass the winter as small caterpillars, only one-quarter of an inch in length and there are from 200 to 300 inside each nest. The caterpillars themselves are black, but are covered with rusty hairs but they can be at once recognized by two conspicuous orange cushion-like tubercles on the top of the 10th and 11th segments towards the end of the body.

Remedies.—The remedies for this dangerous enemy are the collection of the winter nests of the caterpillars and the systematic spraying of all orchards during the summer. For this purpose the poisoned Bordeaux mixture is the best remedy and will control at the same time the Brown-tail Moth and all other leaf eating caterpillars, and will reduce better than any other known remedy, the fungous disease known as the Black Spot of the Apple and Pear, which frequently does great injury to the important apple crop of the Maritime Provinces. As the Cankerworm is a frequent and destructive pest in Nova Scotian orchards, one spraying should always be done within two or three days after the apple blossoms fall. At that time the Cankerworm can be more easily destroyed than at any other time, but if it is left unmolested until half grown it is extremely resistant to the effects of arsenical poisoning. As poisons for the above purpose, arsenate of lead and Paris green are probably the best. Of the arsenate of lead there are several brands in the market and the material can also be made at home, but for convenience and effectiveness probably the manufactured article is the most satisfactory, because it is not only put up in very convenient packages but the chemicals with which arsenate of lead is made, are sometimes variable in quality, whereas in the large factories these materials are tested carefully to see if they are up to standard. When using Paris green in Bordeaux mixture, one pound may be used in 100 gallons of the Bordeaux mixture. This is stronger than is actually required, but the lime in Bordeaux mixture will neutralize the caustic effects of the arsenate and the Brown-tail Moth is a very serious pest which must be dealt with, with drastic measures, and the same may be said of the Cankerworm. Arsenate of lead should be used at the rate of three pounds of the paste to a 40-gallon cask of Bordeaux mixture. It may be well to warn fruit growers against using arsenites in what is known as the soda-Bordeaux mixture, more properly called Burgundy mixture. The true Bordeaux mixture is made with lime and for all ordinary purposes on fruit trees the amount recommended is 4 lbs. of bluestone, 4 lbs. of unslacked lime, 4 ounces of Paris green and 40 gallons of water, but for certain pests more Paris green is advisable and by increasing the amount of lime a little it becomes a safe application for orchard trees while the leaves are young and vigorous, but the arsenites should always be applied in the real Bordeaux mixture made with lime and not with the soda-Bordeaux.

In the report of the Chemist of the Experimental Farms for 1905, at page 149, will be found an article on the Chemistry of Insecticides and Fungicides. In the conclusions of Mr. Shutt's experiments the matter is summed up as follows: 'Burgundy mixture pure and simple has shown itself as far as our experiments have gone, to be

non-injurious to foliage. The addition of Paris green or other arsenite, however, renders the spray corrosive and therefore dangerous for orchard use. When it is desired to use Paris green as an insecticide in the spray, only Bordeaux mixture made with lime should be employed.'

Cankerworms.—Reports of rather serious nature came to hand with regard to the injuries of cankerworms in the apple orchards of the Annapolis Valley of Nova Scotia. These caterpillars are very slender and inconspicuous at first and are frequently overlooked until they have attained considerable growth. They are then much more difficult to kill with the ordinary insecticides used in orchards and it becomes necessary to use more poison to the barrel than for most other insects. It is recommended to use as much as one pound of Paris green in 100 gallons of Bordeaux mixture and this latter should be made with five pounds of lime to the four pounds of copper sulphate in the 40 gallons of water. If applied while the caterpillars are young the cankerworm can be controlled the same as every other leaf-eating insect. The other remedy for cankerworms is the destruction of the wingless female moths when they leave their chrysalids in the autumn and climb up the trees to lay their eggs. There are two materials which are largely used for this purpose. These are printers' ink thinned with fish oil, one gallon of the latter to five of the former, which quantity will treat about an acre of orchard, and the other is a mixture of castor oil and resin. Mr. O. T. Springer, of Burlington, Ontario, gives the following receipt:—

For cold weather; castor oil 2 pounds, common resin 3 pounds; for warm weather add another pound of resin. This mixture must be heated slowly until all the resin is melted, and then should be painted directly on to the bark of the trees while still warm.

Mr. Geo. E. Fisher, of Freeman, Ont., after many experiments uses the same materials but prepares them rather differently. He writes: 'For use against cankerworms, I use for warm weather, 3 pounds of castor oil and 5 pounds of resin, and in cold weather equal parts of both by weight. A little experience is necessary to decide just what proportions of the materials will suit the prevailing weather conditions, but they will vary between the weights I have given. The rough bark of the tree should be scraped off at a convenient height before applying the mixture. The first application will not remain sticky very long, being apparently absorbed by the bark, and a second may be necessary in about a week. This will keep fresh for a good while, and certainly is an excellent trap for cankerworms either in the moth or caterpillar stage.' When applying these mixtures they are painted directly on to the bark of the tree with a large paint brush so as to form a band right around the trunk about three inches wide. The castor oil used is a commercial article, unpurified, which will cost in most places about 8 or 10 cents a pound. Mr. Springer says that the work of banding in the above mentioned way is not so great as might be supposed. One man can go over 250 trees in ten hours if the mixture is ready for use. Should the mixture get too cold to spread readily it may be easily and quickly brought to the proper temperature by using a portable oil stove. It is best to put on the first coat plentifully so as to leave a good body of material on the tree. In the Burlington district, which is near Hamilton, Ont., the female moth seldom leaves the ground before the last week in October and never before the first frosts of autumn. If watched for and the bands are painted on to the trees when the females first appear, thousands are caught by the band, including many of the males, which also are destroyed, their delicate wings adhering to the sticky material on the slightest touch. The females, unable to cross the sticky bands, lay their eggs in large numbers on the trunks of the trees between the ground and the band. These must be scraped off and destroyed during the winter or the caterpillars will climb up into the foliage when they hatch in the following spring, for by that time the bands will have dried on the surface or will have become rough by rubbish or dust adhering to them.

The Rusty Tussock Moth, *Notolophus antiqua*, L.—The work which has been done in Nova Scotia in collecting the larvæ of the Brown-tail Moth has shown that

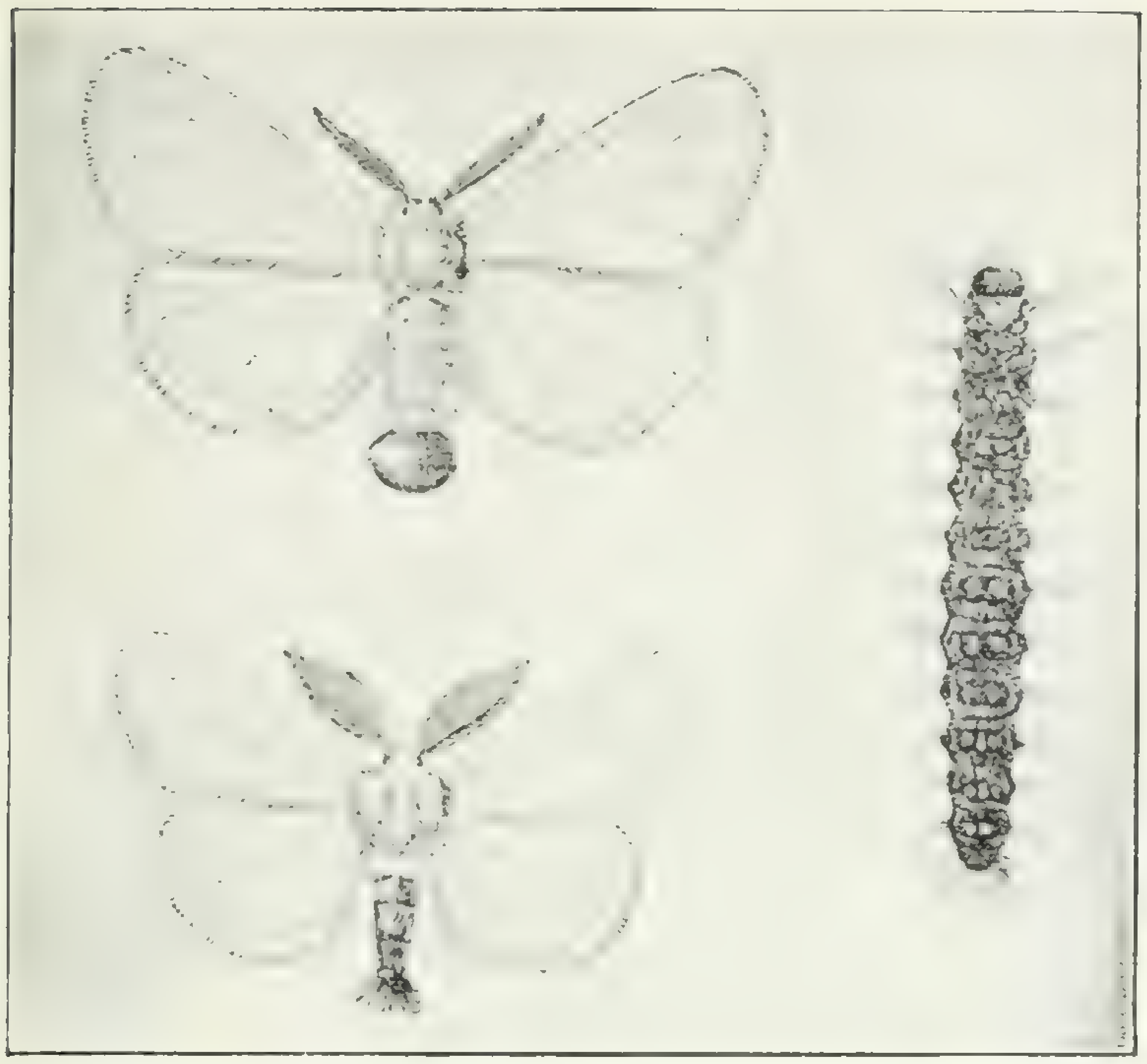
considerable injury is done every year to apple and other fruit trees by the Rusty Tussock Moth, not only in eating the leaves of the trees but by gnawing cavities in the sides of the growing apples. Both the Rusty Tussock Moth and the White-marked Tussock Moth occur in Nova Scotia, and the work of both is very similar, but the latter is the more serious pest of the two because it generally occurs in large colonies and not in the scattered way that the former does. The two insects are quite different and easily recognized in all their stages. The caterpillar of the Rusty Tussock Moth is a much less showy insect than its near relative. The general appearance of the body is gray with four short thick tufts of whitish hairs on segments 5, 6, 7 and 8 with red spots along the sides and a yellow line beneath the spiracles. The most conspicuous difference is that the head is black instead of coral red as in the caterpillar of the White-marked Tussock Moth and there is an extra pair of long tufts of barbed bristles on each side of the 6th segment (counting the head as the 1st), which are entirely lacking in the allied species. The yellow stripes down the back so conspicuous in the White-marked Tussock Moth caterpillar are almost obliterated in that of the Rusty Tussock Moth. The food habits of the Rusty Tussock Moth are very much less restricted than those of the White-marked species, which is almost confined to the foliage of trees, while the caterpillars of the Rusty Tussock Moth may be found upon almost any kind of tree, shrub or herbaceous plant. They seem to be particularly partial to the foliage of geraniums and some other garden flowers. The moths are also different. In the Rusty Tussock Moth the male is of a rust-brown colour, the front wings crosssed by two wavy streaks and there is a conspicuous white crescent near the hind angle of each. The wings expand a little over an inch. The female is gray and practically wingless, in this respect resembling the female of the White-marked Tussock Moth. The male of the White-marked Tussock Moth is gray and the wings are crossed by wavy bands. The base of the front wings bears a dark patch and there is another of smaller size towards the tip. There is also a small white spot near the outer hind angle of the front wings. In both species the wingless females on emerging from their cocoons remain there at rest for their whole moth existence. The males seek them out and after pairing, the eggs are laid on or close to the cocoon. Those of the Rusty Tussock Moth are bare and easily distinguishable but in the White-marked Tussock Moth they are covered with a frothy white deposit so that their shape cannot be seen without breaking up the egg mass.

Both of these insects are sometimes the cause of considerable injury and neither should be allowed to increase with impunity. In many of our Canadian cities the beautiful shade trees are year after year rendered unsightly by these caterpillars and little is done to check them except an occasional spasmodic effort when they have become so bad that the municipal authorities are compelled to do something.

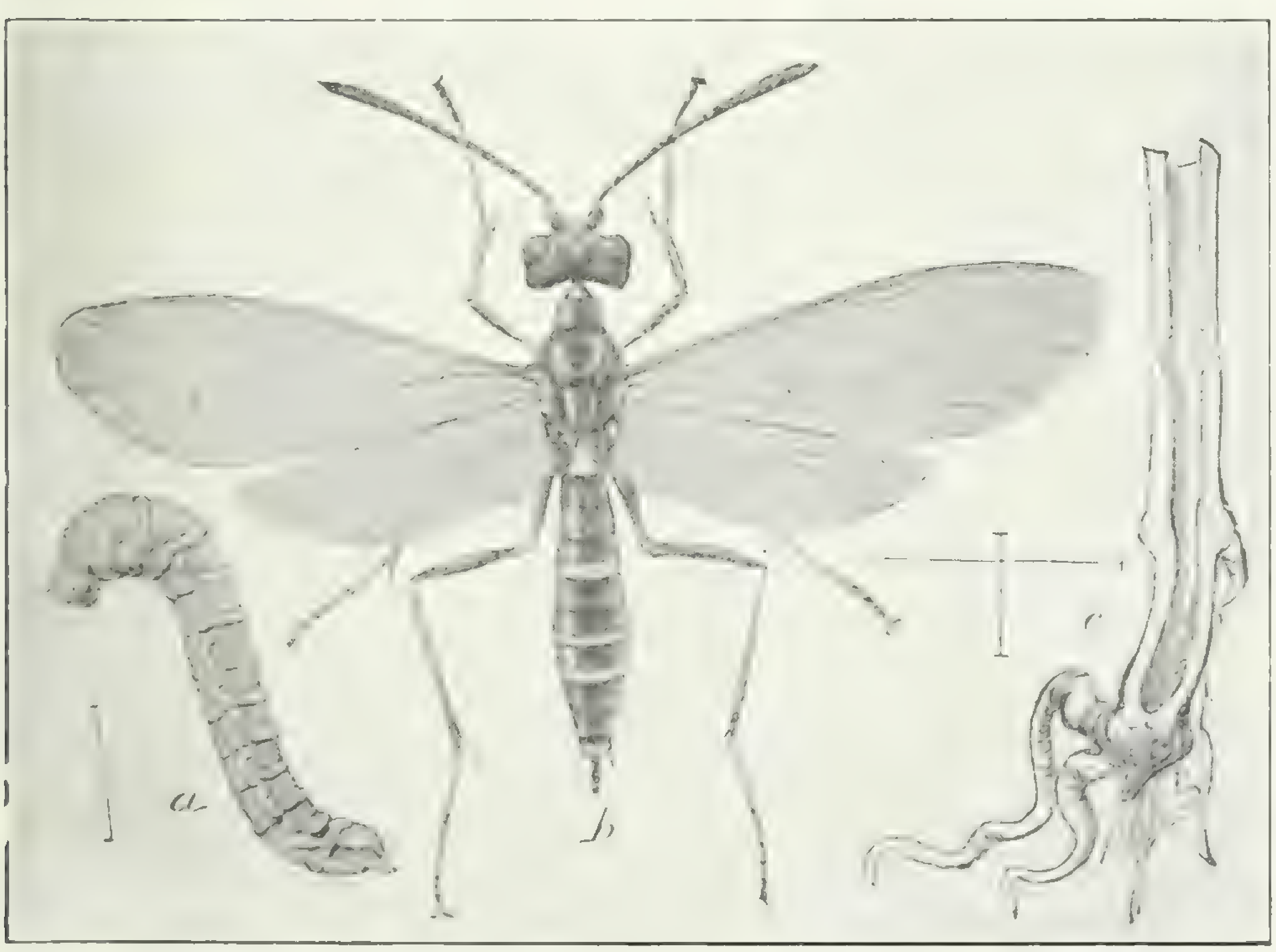
The remedies are the spraying of the trees as soon as possible after the young caterpillars have made their appearance, and the collection of the egg-masses during the winter.

The Hickory Tussock Moth, *Halisidota caryæ*, Harr.—Throughout the whole of eastern Canada considerable damage was done to forest trees of several kinds, such as hickory, elm, birch, ash and basswood by the black and white hairy caterpillars of the Hickory Tussock Moth. These caterpillars occurred in unusual abundance in 1907. When young the caterpillars are very gregarious and frequently strip whole branches of a tree. They have a habit of collecting together in dense clusters beneath the leaves at night, but when feeding spreading out all over the tree making silken paths as they travel along the branches. This caterpillar is particularly objectionable as an orchard and shade tree pest because when falling on the bare skin the barbed hairs produce a painful and persistent irritation.

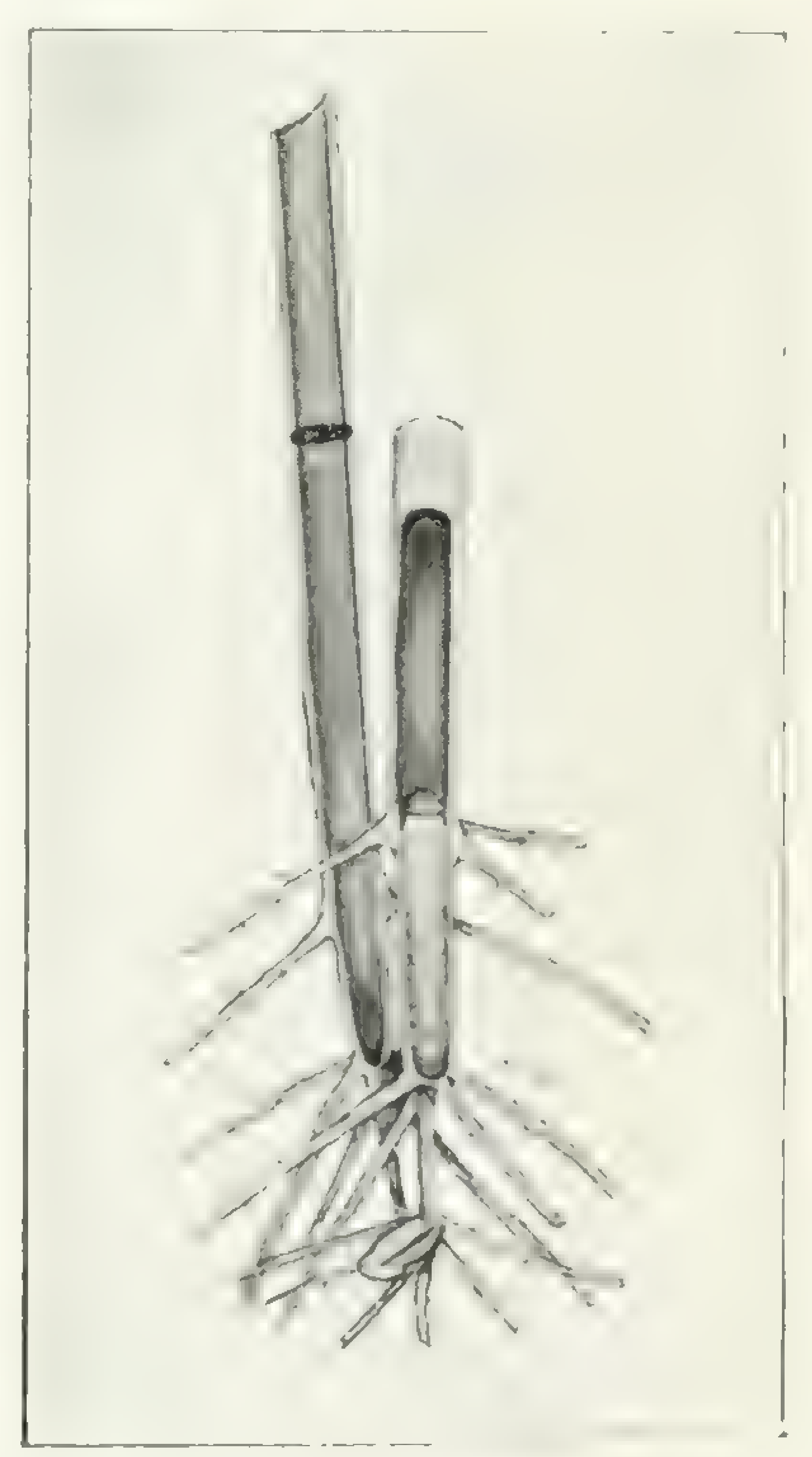
The caterpillar of the Hickory Tussock Moth when full grown is described as follows by Mr. Arthur Gibson in an article written for the report of the Entomological Society of Ontario for 1907, at page 84. 'The body is clothed with dense tufts of white hairs with a ridge of black hairs down the centre of the back, and two pairs of



Female and male moths ; full-grown caterpillar. Winter nest. (After Kirkland.)
(*Figures from Howard, U. S. Dept. of Agr. Farmers Bull,* 264.)
THE BROWN-TAIL MOTH ; *Euproctis chrysorrhœa*, L.



Western Wheat-stem Sawfly. (*Cephus occidentalis*, Riley & Marlatt.)
(*Riley & Marlatt, Insect Life, IV, Div. Ent. U. S. Dept. Agr.*)



Larva and work of the Western Wheat stem Saw-fly.
(*Drawn by Norman Criddle.*)

long black pencils on the 1st and 7th abdominal segments. When full-grown this caterpillar is one inch and a half in length.'

Occurring with the above and almost as abundant was the rather handsomer caterpillar of the Spotted Halisidota, *Halisidota maculata,* Harr., which is covered with tufts of bright yellow and black hairs, the black tufts being on the four anterior and the three posterior segments, the yellow tufts on the central segments of the body. These latter are centered down the middle of the back with a row of black tufts. This larva is rather shorter than that of the Hickory Tussock Moth and although a general feeder like the other seems to prefer willows and poplars to other food.

Large numbers of these caterpillars were sent in by correspondents who had been attracted by their appearance or who had suffered from the irritation of their bristles. In the autumn and early spring large numbers of the close oval cocoons beset with the bristles of the caterpillars were found beneath stones in woods and in other shelters near where the caterpillars had fed. Many of these were found to be parasitized by *Pimpla pedalis,* Cress.

As a rule neither of these insects develop into pests of importance, but upon occasion, as during 1907, their attacks upon shade trees are serious.

A sufficient remedy is spraying the trees when the caterpillars are noticed with Paris green or any other of the arsenical poisons. Both of these species are late summer and autumn insects and neither of them has so far proved a serious orchard pest.

THE APIARY.

The Apiary is under the management of Mr. D. D. Gray, the farm foreman, whose report I append herewith. The practical work of handling and caring for the bees has been done by Mr. C. A. Burnside. There was a considerable amount of disease in the colonies in the beginning of the year, but by the end of the season this had disappeared and such colonies as we had were in good condition. The inclement weather of early spring rendered the services of bees in fertilizing fruit conspicuously apparent. In orchards situated near apiaries there was a considerable increase in the fruit over those not so advantageously located. It having been decided to reduce the number of colonies in the apiary, some of those which were strong and healthy were sold and the number on our own stands was reduced to 32.

REPORT OF MR. D. D. GRAY.

Season of 1907.

The spring of 1907 was very cold and backward.

The bees were placed on their summer stands on April 20, nearly all very badly affected with dysentery and very weak, in fact a number dwindled and died, although they had had plenty of stores through the winter.

The weather continued cold and windy well on into May and the first notice of pollen being gathered to any extent was on May 10. Some feeding was done to encourage brood-rearing and by June 15 quite a number were strong enough to have supers put on and by the first week in July all were ready for work. The first swarm came off on July 10 and we had six of an increase from the 32 colonies put out on the stands. There were a few colonies, however, which escaped with very little of the disease and these did well, one colony making 215 lbs. of honey.

The bees were put into their winter quarters on November 13 weighing an average of about 50 lbs. each.

All the colonies were raised from the bottom boards and blocked up 1 inch all around between brood chamber and bottom board to allow for better ventilation. The wooden covers were also removed and replaced by bran sacks, 2 or 3 being put on each colony.

The bees were examined from time to time and kept as nearly as possible at a temperature of 45° to 50°, and at time of writing, April 1, are seemingly in good condition and quiet, keeping well clustered up in the combs.

D. D. GRAY.

INSTRUCTIONS FOR SENDING INSECTS THROUGH THE MAIL.

A constant source of inconvenience and loss of time to the officials of the Division is the manner in which insects and plants are sent in for identification. It is most advisable that inquiries should always be accompanied by specimens and that these should be packed in such a way that they may come safely by mail without the parcels being crushed and destroyed, or in the case of living insects so that these should not escape. Experience has proved that it is a very difficult thing for those who do not make a study of natural history to write descriptions of either insects or plants so that they can be recognized without specimens. There is also a tendency everywhere to give new and local names to any enemy which has forced itself upon the notice of farmers, fruit growers and others, by its sudden appearance in unusual numbers or by its injuries to crops. These local names are as a rule not in the least descriptive of the pest and only in the very rarest instances are they in any way applicable to any striking characteristic of the insect or plant to which they are given. They are generally quite unintelligible to others and are a source of dire distress, annoyance and waste of time to the specialist who is referred to for information, unless specimens accompany the inquiry. It may certainly be accepted as a general principle that any insect or weed which occurs in sufficient numbers to be troublesome is not of a new kind which requires re-naming. There are now several sources of reference in Canada, where every one who wishes to do so can find out with very little trouble the nature and habits of any unwelcome visitor which may appear in farm or garden. All that is necessary is to send a specimen to one of the many government institutions or agricultural papers with a few lines descriptive of the occurrence and a statement of what information is desired. When such inquiries are made the following rules may be followed and are merely mentioned here, surprising as it may seem, because they are so frequently neglected by correspondents of this Division.

1. Sign the letter of inquiry and give post office address in full, stating province and post office to which a reply should be sent.

2. Send specimens representative of the species. In the case of plants, if possible, send flower, leaf and root. As everything comes free by mail to the Experimental Farm, Ottawa, and the postmasters in all parts of Canada have printed instructions to this effect (Canada official Postal Guide, 1908, p. xxiv), there is no advantage to any one, and a great disadvantage when accurate information is desired, in sending small chips instead of proper specimens.

3. In all cases write the name of sender with his address on the packet.

4. Do not inclose letters inside packets of specimens but send them separately.

5. Do not send specimens without a letter or note saying what information is desired.

6. Do not send fragile specimens in paper boxes. The post office officials have sometimes to handle several tons' weight of mail, and fragile packets are easily broken under such circumstances.

7. Do not send specimens in glass bottles or in liquid unless carefully protected.

8. When sending specimens or writing for information let the letter and the specimens if possible go by the same mail.

9. Living specimens of insects or plants should always if possible be sent in tin boxes. Insects should always be accompanied by some of the food plant for them to feed upon during the journey. Tin boxes prevent the evaporation of moisture and

keep the food plants fresh. For this reason as well as for the greatest safety of the specimens they are very much preferable to cardboard boxes.

10. When sending specimens do not punch holes through the box for the insects to breathe through. These are quite unnecessary and as a general thing cause the death of the specimens.

It will be easily understood how very inconvenient it is in an office with a limited staff, but with a very large daily correspondence, when, as frequently happens, four or five packets of insects or plants arrive by the same mail without any name on them of the sender and without any letter stating what information is desired. Parcels when sent through the post offices are very seldom postmarked and all that can be done is to hold them over for some days and then compare the writing of the address with letters which have been received during the past week. This means, frequently, in the case of specimens of important pests which we want to know about or concerning which an immediate reply should be given, looking through about one hundred letters. The inconvenience of caring for these parcels is also considerable. Living specimens have to be unpacked and fed and provisional numbers and labels put on each, so that they may be recognized in case letters turn up afterwards. Notwithstanding every care to keep these parcels straightened out there are every year many which come to hand which can never be acknowledged, either because the parcels have nothing on them by which we can associate them with letters or because the letters are not signed.

In addition to specimens which are sent in by farmers, fruit-growers and gardeners, many insects and plants are sent in for identification by those who are studying natural history in a more or less scientific manner. An excellent sign for getting better results in farming, is that, many of the younger farmers and fruit-growers in the country are now making reference collections of injurious insects and weeds, so that they may become more familiar with these enemies from which they every year suffer so much. These collections are continually being received for identification and classification by the officers of the Division of Entomology and Botany. Similar collections are sent in by teachers and other students.

The study of entomology in Canada is now receiving a good deal more attention than heretofore. Each season sees new collectors in the field and much of the material collected is sent to Ottawa for identification. Unfortunately, however, many of these specimens received here are more or less injured from lack of knowledge as to the proper way to pack, or of care in doing up the parcels. It is a constant matter of surprise to see how few of even experienced entomologists, know how to pack specimens for sending by mail. A frequent disappointment experienced at the Division is to find on opening a box, valuable specimens which have been entirely ruined through the neglect of some small or commonsense precaution in sending the specimens. Mail matter received at large centres must of necessity be handled quickly and a moment's thought will convince any one that a box containing specimens of fragile pinned insects, wrapped only in the paper on which the address is written, has very little chance of reaching its destination with the contents intact. Many such consignments come to us with nearly every specimen broken.

There are several good ways of packing boxes of pinned specimens. The box containing the insects firmly pinned, the pins being forced into the cork at the bottom with a pair of forceps, can be wrapped lightly with cotton batting, or some other light elastic material, and the whole placed inside a larger box of wood or strong cardboard. The inside box should be wrapped neatly in thin paper and tied up to keep out dust. The elastic packing between the two boxes will protect the specimens from being broken by the jarring in the mails. Another excellent way which may be used when it is not convenient to obtain an outside box of the right size, and indeed is the method most in use by entomologists, is to simply surround the box of specimens after wrapping it in paper, with a good supply of cotton batting, hay, straw, excelsior or

other light material of an elastic nature, and then wrap this in good strong paper. The address of the person to whom the specimens are sent should always be written on a separate label which should be tied to the parcel so that this may receive the postmark instead of the parcel, should the postmaster stamp it while passing through the mail. It may be remembered that it is always better to put too much packing than too little and when the box containing the specimens is protected by an outside box there should be plenty of space between the two. An ordinary shallow cigar box corked at the bottom answers very well to pin insects in. Cork is by far the best material to use for this purpose but corrugated paper, pith, sheets of peat, or any other soft penetrable material may be used if of sufficient depth to support the pin securely.

Packages packed as above will come safely through the mails and may, as in the case of letters, be sent to the Division of Entomology at the Central Experimental Farm, free of all postage. If for any reason it is desirable to send specimens by express, this can be done by placing the box of insects in an ordinary fruit basket, surrounding it well with light packing, such as is mentioned above, and covering the top with ordinary wrapping paper. When sent by express, charges on the parcel must be prepaid by the sender.

A convenient way of sending specimens for identification, particularly when these are winged insects, such as butterflies and moths, is to put each specimen in a small envelope as soon as it is killed, with the wings folded backwards over the back. This should be done before they become too dry and brittle, or the legs and antennæ will be broken, which very much reduces their value as scientific specimens.

The killing bottle used for insects is easily made. Having procured a wide-mouthed bottle, place in the bottom of it two or three small pieces of cyanide of potassium, each of about the size of a hazel nut, and then mix some fresh plaster of Paris into a thick paste and pour enough of it into the bottle to entirely cover up the poison. The plaster will set in about half an hour and the bottle is then ready for use. This bottle will last for a year or two if kept closely corked. The fumes given off will pass through the plaster and will kill any insect put in the bottle in a few minutes. When insects are packed in the envelopes these should at once have written on them the date and exact locality of capture, as well as the name or initials of the collector. They should then be packed away in a firm box and should not be moved again until such time as they are to be relaxed for examination or mounting for the cabinet. To relax specimens all that is necessary is to soak a cloth in water and then after wringing out the superfluous water by twisting it tightly, place the envelopes between the folds without opening them and leave them there for 12 to 24 hours according to the size of the insect. They will then be soft enough to be set on the setting boards. When set they should be left on the boards for at least a week, so as to become thoroughly dry or the wings will not remain even, after they are put in the cabinet. This 'springing back' of the wings spoils the appearance of the specimens in the collection. The envelopes used by entomologists are not gummed but are made as required. A convenient size can be made by taking oblongs of any moderately stiff paper, 4 inches long by 3 wide, and folding them diagonally down the middle so that the portion folded down reaches to within half an inch of the end of the opposite side, the half-inch flap is then folded down over the central triangular double folded portion and the envelope is turned over and the flap on the other side is treated in a similar way. This gives a triangular envelope which can be opened by taking the flaps on each side with the finger and thumb of each hand, and the specimen can be examined without danger of breaking it. This cannot be done easily with an envelope made in the usual way. The envelopes can of course be made of any size to fit the specimens to be saved.

When plants are sent as botanical specimens to be named, they should first be dried in the usual manner between sheets of absorbent paper and each specimen should be placed on a separate piece of newspaper, cut to a convenient size for mailing. With each specimen or written on the sheet of packing paper, should be a note of the date

and locality where it was collected. Unmounted specimens are preferable for examination to those mounted or fastened down to sheets of mounting paper. Botanical specimens should never be fastened down in bound books and there should never be more than one kind of plant on each sheet. A bundle of dried plants can be sent safely by mail if protected on the outside with sheets of cardboard.

When plants are sent in as weeds or merely to get the names of a few specimens, all that is necessary is to roll up each one separately in a piece of paper and number the specimens in accordance with notes on each given in the accompanying letter of inquiry. If it is desired to have the specimens returned this should always be stated and as with specimens of insects every packet of plants should have the name of the sender written plainly on the outside and be accompanied by a letter enclosed in a separate envelope.

Under the above conditions it is always a great pleasure to examine and report upon any specimens which may be sent in, and all will be attended to and the report sent back as promptly as other work in the Division will allow of, but when several plants are tied up in a bundle or crowded into an envelope, as is sometimes done by our correspondents, frequently in a moist condition, much time is wasted in doing here what the enquirers ought to have done before sending in the specimens. Moreover when they get their plants back again they are of far less value to them for purposes of identification than if they had dried them and packed them with a little care at first.

When correspondents wish it, we are always pleased to return the specimens sent in for naming; but when they have duplicates in good condition we are glad to get them either for our own collections in the Division or for other correspondents who frequently ask for specimens of special plants or insects. Very many species of natural history objects although very common in certain localities, do not occur at all or are quite rare at other places.

REPORT OF THE CEREALIST

Chas. E. Saunders, B.A., Ph. D.

Ottawa, March 31, 1908.

Dr. Wm. Saunders, C.M.G.,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the fifth annual report of the Cereal Division.

One of the chief problems which has occupied my time during the year has been the cross-breeding and selecting of varieties of wheat, oats, barley, peas, beans and flax, for the production of superior sorts suitable to the varied requirements of Canada. The past season was on the whole quite favourable for cereals at Ottawa and good progress was therefore made in this important work. Considerable attention has also been given to milling and baking tests of wheat with special reference to the strength of the flour produced from different sorts of winter wheat and durum wheat. Further work has also been done on some of the important problems connected with the influence of storage on the baking strength of flour.

During the year I took part in the preparation of three bulletins : No. 57 on 'Quality in Wheat,' No. 58 on 'The Results from Trial Plots of Grain,' &c., and No. 60 on 'The Grades of Wheat in the Manitoba Inspection Division.' I also prepared a circular on 'Preston and Other Early-ripening Wheats.'

In January of this year I attended an important and helpful meeting of plant-breeders at Washington, D.C., where I presented a paper on 'The Cross-fertilizing of Cereals.'

For some samples of interesting varieties of grain my thanks are due to the Department of Agriculture at St. Petersburg, Russia, the Department of Agriculture at Washington, D.C., to Surgeon-Major George Henderson of Otford, England, and to A. H. Danielson, Esq., of Fort Collins, Colorado.

To the foreman in charge of the field work of the Division, Mr. George J. Fixter, I am much indebted for careful supervision of the plot work and accurate records in regard to the different varieties of grain, field roots, &c.

In the following pages some of the most important results of the work of the year are recorded and discussed.

I have the honour to be,
Your obedient servant,

CHARLES E. SAUNDERS,
Cerealist.

PUBLICATIONS.

Two bulletins on wheat and flour were prepared during the year by the Chemist and the Cerealist jointly. Bulletin No. 57 on 'Quality in Wheat' published in October, gives a complete account of the methods used in the Cereal Division in carrying out the milling and baking tests of wheat and a statement of the principal conclusions which could be drawn at that time from the researches in progress. As copies of this bulletin are still available for distribution it is unnecessary to give any statement here of the principal matters of which it treats.

Bulletin No. 60, which is now ready for publication, contains an account of the study of the grades of wheat of the current season in the Manitoba Inspection Division. In it some interesting facts are brought out in regard to the characteristics of the various grades of wheat, especially those containing a noticeable proportion of immature and 'frosted' kernels.

In addition to these two bulletins a circular on 'Preston and other Early-ripening Wheats,' prepared by the Cerealist, was issued, during the present month. The object of this circular was to give to farmers in the great wheat-growing provinces concise and accurate information in regard to the characteristics and qualities of Preston and some other wheats which are now attracting considerable attention on account of their earliness. The information given in this circular was obtained from a study of the field records of these varieties and from the extensive milling and baking tests which have been carried on by the Cerealist for some years.

The Annual Crop Bulletin (No. 58) issued in December, giving the results obtained in 1907 from the trial plots of grain, &c., was partly prepared by the Cerealist.

CROSSING AND SELECTION OF CEREALS, ETC.

Some interesting crosses were effected this past season, especially in barley and in beans. The chief objects in view in the barley crosses were the production of early-maturing hulless and beardless varieties with stiff straw of fair length. To combine all these desired characteristics in one sort may require repeated crossing; but there seems to be no doubt that the results wished for can eventually be obtained. In beans some crossses were made looking to the production of productive white varieties of early-ripening habit.

The selection of the progeny of the crosses made by the writer in the year 1903 has at last resulted in the production of a number of fixed sorts, though the larger proportion is still unfixed. About 130 of these new cross-bred varieties of wheat, barley, oats and peas are ready for propagation this spring. About 70 of these are early-maturing sorts of hard, red wheat which have been selected with a view to the production of strong flour of good colour. Red Fife is one of the parents in most of these cases. The number of these new sorts will, of course, be very considerably reduced during the next two or three years while they are being propagated and being tested in the milling and baking laboratory.

The production and propagation of selected strains of the standard and older varieties of grain are being continued with good results. Some of the new strains of wheat show distinct points of superiority over the original varieties from which they were obtained; and all of them form striking object lessons on account of their remarkable uniformity in height, colour, &c.

A beginning has been made in the production and testing of selected strains of flax, from which good results are expected, as ordinary flax is quite lacking in uniformity.

METHOD OF CROSS-FERTILIZING IN CEREALS.

As no description of the method by which the important operation of cross-fertilizing of cereals is carried out has been published for many years in the reports of the experimental farms it seems desirable to give a brief statement on this subject, especially since the manner of operating has been somewhat modified by the writer during the last few years.

Though the floral organs of cereals are quite inconspicuous they are similar in all essential respects to those of other flowering plants and consist of the pollen-bearing organs, called anthers, (three in number) and a branched, feathery pistil at the base of which lies the undeveloped seed. In order that this seed may be fertilized it is necesssary that some of the pollen shed by the anthers (which burst when they have reached full maturity) should fall upon the pistil. When lodged on the pistil the pollen grains send out small thread-like growths called the pollen tubes which penetrate the substance of the pistil. When one of these pollen-tubes reaches the base of the pistil it passes into the immature seed and unites with it. This process is spoken of as 'fertilization,' and causes the seed to begin its development at once.

Under natural conditions, in wheat, oats and barley, the anthers burst and shed their pollen upon the pistil before the glumes (chaff) have opened. Afterwards the glumes part for a few minutes, during which time the empty (or nearly empty) anthers are pushed out. After the glumes have closed again the anthers usually remain for some days hanging at the end of their fine thread-like filaments. When numerous anthers are so hanging on a head the plant is commonly said to be 'in blossom,' although strictly speaking the flowering period is then almost or quite passed.

The drawings on the annexed plate No. 6 will serve to make clear the form and arrangement of the floral organs, and the appearance of a wheat head when in flower.

Fig. 1 represents a portion of a head of wheat from which all the spikelets but one have been removed. The drawing was made from nature but is magnified 4 diameters (16 times). A is the rachis, the part of the head to which the spikelets are attached. The points marked A1 show the places from which the spikelets have been removed.

B1 is the outer glume and B2 the second glume, both bent back very far. The glumes constitute which is commonly called the chaff.

C1 and C2 are two of the anthers, the third anther being shown about midway between them.

D is one branch of the feathery pistil. The other branch on the opposite side can easily be seen also. Just below where the two branches of the pistil unite is the point where the undeveloped seed is situated. Behind the pistil and the central anther is shown the inner glume which serves to enclose the kernel on the inner side of the spikelet. The remainder of the drawing shows portions of the glumes which enclose the other flowers in this spikelet. A spikelet of wheat has usually five flowers though as a rule not more than three kernels reach maturity.

Figure 2 is a magnified photograph showing the branched feather-like pistil of wheat with the undeveloped seed at its base.

Figure 3 shows a head of wheat with one of the flowers naturally open. Two of the anthers which have been thrust out can be seen.

Figure 4 shows a head of wheat 'in blossom' with numerous, empty anthers visible.

While natural crosses in cereals are sometimes produced, no doubt by pollen from some neighbouring head falling on the pistil during the short period while the glumes are open, it is usually necessary to resort to artificial means when one wishes to produce cross-bred varieties. The essential parts of the operation are the removal of the anthers from one flower before they have burst and the bringing of pollen from a flower of some other variety and applying this pollen to the pistil of the prepared flower. It is customary to speak of the plant from which the anthers are rejected as the 'female' or 'seed parent' and the plant from which the anthers are collected and the pollen used as the 'male' or 'pollen parent.' Of course the same plant may

quite conveniently be used as female in one cross and as male in another, when it bears several heads.

In performing the operations connected with artificial cross-fertilization different workers employ somewhat diverse methods, but in any case no elaborate outfit of surgeon's instruments is necessary, however effective such a display may make in a photograph intended to excite the wonder of the public. An efficient set of tools may include only: one small pair of forceps, a very small sable brush (about No. 1) and a pair of scissors. In addition to these, two or three small turned wooden boxes for pollen are required as well as some string and a small quantity of some light cotton material (such as cheesecloth) with an open mesh.

The most suitable weather for the cross-fertilizing of grain appears to be that which is bright and sunny, but not excessively hot. Almost any time of day seems satisfactory in favourable weather, but the afternoon seems preferable when the weather is very warm. But in regard to both of these points many more observations will be necessary before any definite statements can be made.

It is not wise to use in cross-fertilizing any plants grown in an ordinary field plot as there is usually some slight element of uncertainty in regard to such plants. A convenient plan is to sow all the varieties to be used either as male or female in the form of very small groups of a dozen or two of seeds each, all the groups being comparatively near together and located in some place not freely accessible to the public.

When the heads have reached the proper stage for cross-fertilizing it is perhaps best to begin by collecting the pollen from the variety to be used as the male. It is important, however, that pollen should not be collected long in advance. While exhaustive experiments covering this point have not been made I have found that, as a rule, better results are obtained from fresh pollen than from pollen which has been gathered for even as short a time as two or three hours. For collecting the pollen, the most convenient method is to pick half a dozen or more heads and then to look these over carefully, using the forceps to remove all the anthers which are seen to be sufficiently mature, as well as any which have just recently burst and have not lost all of their pollen. The anthers as picked out of the heads are put into a small turned, wooden pill-box. The type of box used is about 1½ inches in diameter and made of one piece of wood, being so hollowed inside as to avoid any sharp corners or angles. This box is prepared for use by being blackened and then coated heavily with shellac varnish, so that the pollen may be easily seen and easily removed. When sufficient anthers have been gathered, the box containing them should be set aside in the shade, while the flowers to be used as female are being prepared.

It is well to put in a stake before commencing operations on the plant to be used as female. One should then with the scissors remove from the head selected for the operation the spikelets near the base and tip, as these generally produce kernels of somewhat less than average size. From each of the remaining spikelets, I usually remove with the forceps all but the two principal flowers. The anthers are then removed from all the flowers left on the head. In performing this operation one needs to be very careful not to break off or to injure any of the glumes belonging to the flowers operated on. The glumes should spring back into their natural position, enclosing the pistil, after the anthers have been taken out. Those flowers in which, when forced open, the anthers are seen to have burst are of course removed at once; care being taken to avoid shaking out any of the loose pollen into the air or allowing any pollen to remain on the forceps. It unfortunately happens very often that the grasping of the anthers by the forceps for the purpose of removing them, causes them to burst if they are fully ripe. In such cases the flower in question should be cut off for fear that some of the pollen may have fallen on the pistil. When all flowers have been prepared, the pollen from the box is applied. Of course there might be advantages in tying up the head and leaving it a day or two for the flowers to become more fully mature and then applying freshly-gathered pollen. This, however, would involve extra work and, as a matter of fact, good success can be had by applying

pollen immediately after the anthers have been removed. Before putting on the pollen, the anthers in the little black box should be picked out, two or three at a time with the forceps, and tapped against the side of the box in order to remove the pollen from them. In this way a fair quantity of pollen can usually be obtained without much difficulty. It should then be brushed together at one side of the box and applied to the flowers in small quantities lifted out on the brush. It may be necessary to very slightly moisten the brush between the lips in order that the pollen may adhere readily to it. This method of dealing with the pollen is not only very convenient but has proved particularly successful, perhaps owing to the fact that the pollen applied to each flower, is the mixed product of many different anthers.

It is a common custom to tie up the head which has been operated upon in some kind of thin paper. It appears that in hot sunny weather this form of covering produces a temperature around the head which is fatal to the setting of the seed. I have, therefore, for some years, used a cotton material, cheesecloth or something of that type, with which to tie up the heads. This material is wound around the head about twice, and tied both above and below the head and usually once loosely around the middle. It may be that in rare cases foreign pollen may be blown in through the openings in this cloth, but such an accident certainly occurs very seldom, if at all; while the advantage of this method of covering the head is great. Of course when one has small groups of plants growing for the sole purpose of this kind of work it is a simple matter to remove any unused heads which are in a fair state of maturity and which might, if blown by the wind, strike against the heads which have been tied up or might shed pollen in their immediate vicinity. It seems best to loosely tie the heads which have been operated on to a stake, though it must be admitted that this method is attended with some difficulties and dangers. The stem should also be loosely tied to the stake at about four different points in order that as it grows it may not bend itself at an angle, which it is quite sure to do if the tying is confined to the head only. For about a week after the head has been operated upon it is well to inspect it twice a day to prevent the occurrence of any accidents due to the rapid growth of the stalk. After this period has elapsed, the heads require no further attention until the seed is ripe. It is, however, perhaps worth while to remove all unused heads from those plants which are being employed as the females in the crosses, so that the full strength of the plants may go to the production of the desired seeds.

In order to show the efficiency of this method it may be mentioned that during the seasons of 1903, 1904, 1905 and 1906 the writer operated, by this method, on 626 flowers of wheat. From these 320 seeds were obtained, nearly all of which germinated. Among the plants produced only ten failed to show evidence of the influence of the supposed male parent. These were no doubt fertilized by pollen of the same variety reaching the pistil at the time the operation was performed or possibly through the cheesecloth after the head was tied up.

It will be seen from these figures that the percentage of success was almost 50 in working with wheat. With barley good success has been obtained by the same method, but with oats the results have not as a rule been satisfactory, only a very small proportion of the flowers operated upon producing seed.

MILLING AND BAKING TESTS.

Considerable work was done during this winter in continuation of the wheat and flour investigations of which some account was given in Bulletin No. 57 published last October. While it does not seem necesssary to give at present all the details of this work, some of the more important observations and conclusions are here stated under the four following headings

SPRING WHEAT.

The baking tests made with flour from varieties of spring wheat gave some interesting results, considerable variations being noticed in some instances from the figures obtained in other years, thus serving to emphasize the importance of the climatic conditions of the season in influencing the flour strength and confirming the conclusion previously reached that, while each variety tends to vary in baking strength within certain rather small characteristic limits, in special cases these variations may assume much greater significance.

A few varieties and selected strains grown at Ottawa in 1907 were baked this winter for the first time. The figures obtained for the baking strength and bread value of some of these are here given; and for purposes of comparison the results of the tests of No. 1 Manitoba Hard and No. 1 Manitoba Northern wheat of the current season are added.

	Baking Strength.	Bread Value.
Red Fife B	97	98
Pringle's Champlain C	94	92
Red Fife M	91	93
Alpha Selected	88	89
Persian Black	81	80
No. 1 Manitoba Hard	95	96
No. 1 Manitoba Northern	91	92

The two grades of northwestern wheat at the end of the list consist chiefly of Red Fife. As, however, the samples used were the official standards (representing the minimum of the grades mentioned) we may fairly conclude that an average sample of No. 1 Northern would show this season a baking strength of about 93 points.

DURUM WHEAT.

The most important and promising varieties of spring wheat of the durum or 'macaroni' class were milled and baked in order to ascertain their relative values for bread making. The results clearly demonstrate the fact which has been frequently stated before that very great differences are found among the wheats of this group and show that they can never be fairly understood or intelligently considered until the importance of these differences is clearly recognized. Durum wheats have certain characteristics as a class (for instance compact heads, large kernels, great hardiness, yellowish colour of flour), but they have no general similarity in regard to flour strength. It is as absurd, therefore to discuss the flour strength of durum wheats in a general way as it would be to consider spring wheats or winter wheats in this manner. The strongest wheats from these three great groups are of about equal strength (Kubanka, Red Fife and Turkey Red for instance) and the weakest are of about the same degree of weakness. Each class contains varieties of all degrees of flour strength.

The wheats used in these tests were all grown at Ottawa in 1907, the season being as usual too wet for them to reach their best development. Most of the samples were of fair quality, however. The figures obtained for baking strength and bread value this winter were as follows, the varieties being arranged in the order of their marks for baking strength:—

	Baking Strength.	Bread Value.
Beloturka	100	96
Kubanka (No. 5639)	95	93
Goose	88	88
Gharnovka	88	87
Cretan	87	84
Yellow Gharnovka	85	85
Red Indian	83	83
Roumanian	72	74

It appears probable for many reasons that Beloturka and Kubanka (No. 5639) are really the same variety. The difference of five points in the scale for strength of flour is not greater than is to be expected when different strains of the same variety are grown in the same field, especially when the soil of the field is of a somewhat variable character.

The bread made from Kubanka and Beloturka was very fine in quality and of a bright yellowish colour. The bread made from the other varieties was decidedly inferior, though Goose and Gharnovka gave a wholesome product of fair quality.

WINTER WHEAT.

Nineteen varieties of winter wheat were milled and baked. The conclusions in regard to strength of flour and bread-making value are given in the following table. All the wheat used was ripened at Ottawa in 1907 under favourable conditions.

	Baking Strength.	Bread Value.
Turkey Red (No. 380)	98	98
Egyptian Amber	89	92
Tasmania Red	89	89
Buda Pesth	86	89
Kharkov	86	88
Imperial Amber	81	86
Reliable	80	84
Prosperity	80	84
Silver Sheaf	75	78
Red Chief	74	79
Dawson's Golden Chaff	73	78
American Banner	72	76
Abundance	71	78
Red Velvet Chaff	71	77
Gold Coin	70	77
Early Windsor	69	77
Invincible	68	75
Early Red Clawson	65	74
Jones' Winter Fife	61	70

While the above figures are not by any means to be accepted as final, but only as giving a general indication of the strength of flour obtainable from the different varieties, the differences observed are of great significance. The very high position occupied by Turkey Red No. 380 is especially noteworthy. The results of this season agree with those of last year in showing that this wheat as grown at Ottawa is superior in baking strength (when tested in the mid-winter following the harvest) to No. 1 Manitoba Hard wheat of the same age. This fact is of interest in view of the common practice of mixing Manitoba with Ontario wheat to increase the strength of the latter. Of course as a rule the Ontario wheat is some weak variety such as Dawson's Golden Chaff. It should also be remembered that the relative positions of any varieties may sometimes be altered by keeping the wheat or flour for some further time after the first test, and that therefore the Ottawa grown Turkey Red might be surpassed by the Manitoba No. 1 Hard if both samples were kept for some months longer.

Next in strength to Turkey Red stand Egyptian Amber, Tasmania Red, Buda Pesth and Kharkov. The latter appears to be essentially the same as Turkey Red, but lower in strength and purity. It is an unselected sample of commercial wheat. The other three are varieties of great interest on account of the fine quality of bread which they produced. Egyptian Amber in particular gave bread of unusual excellence: sufficiently light, of high flavour and with a slight tendency to crumble in the mouth—a very desirable quality which is usually absent from bread made from flour

of the very highest strength. If varieties such as these were generally grown in Ontario for bread-making purposes there should be no occasion to mix with them any northwestern spring wheat to improve their strength. Of course weaker sorts than these are needed for the making of crackers, &c., but such wheats are now grown in rather too large proportions. It should be remembered that the stronger wheats usually bring higher prices.

The relationship between the price of wheat and the baking strength of flour produced from it perhaps deserves a little further consideration. Taking the average Toronto prices of the past winter we find that No. 2 Winter wheat was about 94 cents, and No. 1 Manitoba Northern about $1.20. Now, since the winter wheat is chiefly Dawson's Golden Chaff and other varieties of low baking strength we may safely assume its baking strength to be approximately 70 (most samples of Ontario wheat being probably somewhat weaker than those grown at Ottawa). The baking strength of average No. 1 Northern wheat (determined in mid-winter) has already been stated to be about 93. It appears therefore that this year a difference of 23 points in baking strength corresponds to a difference of 26 cents a bushel in the price of the wheat. Of course other considerations than baking strength must be allowed for if we attempt to reach great accuracy in the calculation. But by making some slight allowance for these other factors, not all of which are against the winter wheats, we can reduce the probable error of calculation to a comparatively small amount.

It appears therefore that this year Turkey Red No. 380 as grown at Ottawa was worth about $1.23 cents a bushel, Egyptian Amber and Tasmania Red about $1.13, and Buda Pesth about $1.10. Of course these valuable varieties did not bring any such prices when grown in any part of Ontario, for the reason that the farmers (if any) who grew them were ignorant of their actual value and buyers judging by appearance only were equally uninformed.

In most years the difference in price between weak and strong wheats has been less than this season. For purposes of general calculation we may therefore assume that (when wheat is high in price) one point on the scale of baking strength is usually equivalent to about one cent in the value of the wheat per bushel. But even on this or a still lower basis the price of the stronger varieties of winter wheat would be much higher than the price of the ordinary varieties.

EFFECT OF STORAGE ON WHEAT AND FLOUR.

It is well known that some increase in baking strength usually takes place when wheat or flour is stored for some months, but our present knowledge of this important subject is very slight. Some striking facts bearing upon this matter were mentioned in Bulletin No. 57, and the milling and baking tests of this winter have added several more observations of considerable value. A few of these are given in the following table:—

Variety.	Where and when grown.	Baking strength, mid-winter 1907.	How kept over.	Baking strength, mid-winter 1908.	Remarks.
Pringle's Champlain	Indian Head, 1906.	80	As wheat.......	91	Colour not much changed.
Red Fife	" " ..	95	"	101	" "
Turkey Red (No. 380)...	Ottawa, 1906......	98	As flour	105	Colour slightly paler.
Tasmania Red..........	" ...	93	"	101	Colour paler.
Downy Riga D..........	"	80	"	103	Colour very much paler.
Prospect	"	89	"	100	Colour paler.
Hungarian White....	"	98	"	103	"
Bishop A	"	90	"	97	Colour much paler.

The above may serve as typical examples. It will be seen that the amount of improvement both in strength and in colour varies very much in the cases cited. In a few of the other flours studied, little or no change could be found. It seems probable that both the rapidity and the amount of improvement are characteristic of each particular variety. The really astonishing changes in Downy Riga D should be noted. This and some other early wheats which are of rather low strength when tested a few months after harvest have shown the most remarkable degree of improvement when kept over, as flour, for a year. From the work already done on this subject it appears that the gain in baking strength is more rapid when the material is stored as flour than when stored as wheat; but the change takes place in both cases and seems to reach the same limit in the end.

As the writer pointed out a year ago, when addressing the Select Standing Committee of the House of Commons on Agriculture and Colonization, this increase in the commercial value of wheat or flour (by storage) owing to the rise in the baking strength is a very important matter and 'suggests the possibility that, in case a large part of our western wheat should ultimately be exported by some northern route, ten or twelve months after harvest, the cost of storage might be partly or entirely covered' by this increase in value.

Using the figures already deduced for estimating the price of one wheat from another when the difference in baking strength has been ascertained, I should estimate that the Pringle's Champlain increased in value (for immediate use) at least 11c. a bushel by keeping for one year, and the Red Fife 6c. a bushel. The Downy Riga kept over as flour showed a gain in value equal to about 23c. per bushel of wheat. These calculations are of course made on the basis of this year's prices and presuppose that the price of wheat of any given quality was the same in midwinter of both years. In these instances there was of course no appreciable change in the appearance of the wheat: a consideration which shows the futility of attempting to estimate strength by appearance.

It is to be hoped that before long the increased value of wheat which has been stored for a considerable time will be more fully recognized, and that such wheat will be sold at the enhanced price warranted by the increased strength and improved colour of the flour which it will yield.

An instructive series of tests was begun last autumn to determine more fully the amount and nature of the changes which take place in wheat and flour when stored for a considerable time. It is expected that some very interesting conclusions will be drawn from this work in the course of about a year. The tests are being carried on by the Chemist and the Cerealist jointly.

CEREALS IN SMALL PLOTS.

Not many fixed varieties of cereals were grown in small plots last season, nearly all the sorts being on hand in sufficient quantities for the sowing of one-sixtieth of an acre. Those varieties which are given under numbers and letters are new sorts produced at this farm and now fixed in type but not yet named. The numerous small plots of unfixed, cross-bred cereals which were grown are not included in this list.

Spring Wheat.

Ladoga (3 plots).
Red Cedar.
Russian (7 plots).
Seven Nations.
Smith's Red Fife.
Tibetan.
6 F 2 (Red Fife × Polish).
7 E 3 (Red Fife × Roumanian).
7 J 4 " "

Oats.

Russian (2 plots).
Sixty Day White (2 strains).

Six-Row Barley.

Archangel, No. 59.
Archangel, No. 62.
Early Indian.
Karim (2 plots).
Leh.
Vologda, No. 417.
Vologda White, No. 418

Two-Row Barley.

Black Two-Row.
Duckbill (4 strains).
Eriwan.
Kars.
Kutais White.
Kutais Purple.

Field Beans.

California Pea Selected.
Marrowfat Selected.
Norwegian Brown Selected.
White Field Selected.

Flax.

Common (8 strains).
La Plata (3 strains).
Novarossick (4 strains)
Russian (4 strains).
White Flowering (4 strains).

UNIFORM TEST PLOTS OF CEREALS, ETC.

The most important varieties of cereals, field roots, &c., which are obtainable commercially are annually grown in test plots along with the cross-bred and selected sorts produced at this farm and other varieties obtained from various sources. The objects of these tests are to determine the relative productiveness, earliness, &c., of the different varieties. Those which for a series of years are found to be distinctly inferior are rejected, in order to keep the list within as small bounds as possible.

The test plots of grain are one-sixtieth of an acre and those of field roots one-hundredth of an acre. In former years one-fortieth acre plots of grain were used, but it was found impossible to properly handle the crop from these plots whenever the weather was showery at harvest time, owing to the limited space available for temporary storage and for threshing. The smaller size of plot can also be more satisfactorily looked after in other ways. It was therefore deemed advisable to reduce the size to the present dimensions, believing that increased accuracy of returns and of purity of seed would result. Undoubtedly the plots of one-sixtieth acre are very small from which to calculate the yield per acre, and much larger plots would certainly be preferable; but since larger crops would necessarily be handled in less perfect ways there would probably be no gain in accuracy unless the plots could be increased to about one-twentieth of an acre: a size which is quite out of the question at this farm.

The number of test plots grown during the past season was as follows:—Spring wheat, 45; durum wheat, 14; winter wheat, 23; emmer and spelt, 11; oats, 65; six-row barley, 30; two-row barley, 28; peas, 28; spring rye, 2; winter rye, 4; field beans, 4; flax, 7; turnips, 14; mangles, 10; carrots, 6; sugar beets, 3; Indian corn, 32; millet, 3; canary seed, 1, making a total of 330 plots, and representing about 300 varieties.

The constant reduction in the number of plots is due to a careful elimination of the less desirable sorts. In this way the opportunity is afforded for much more thorough study of the varieties of greatest importance.

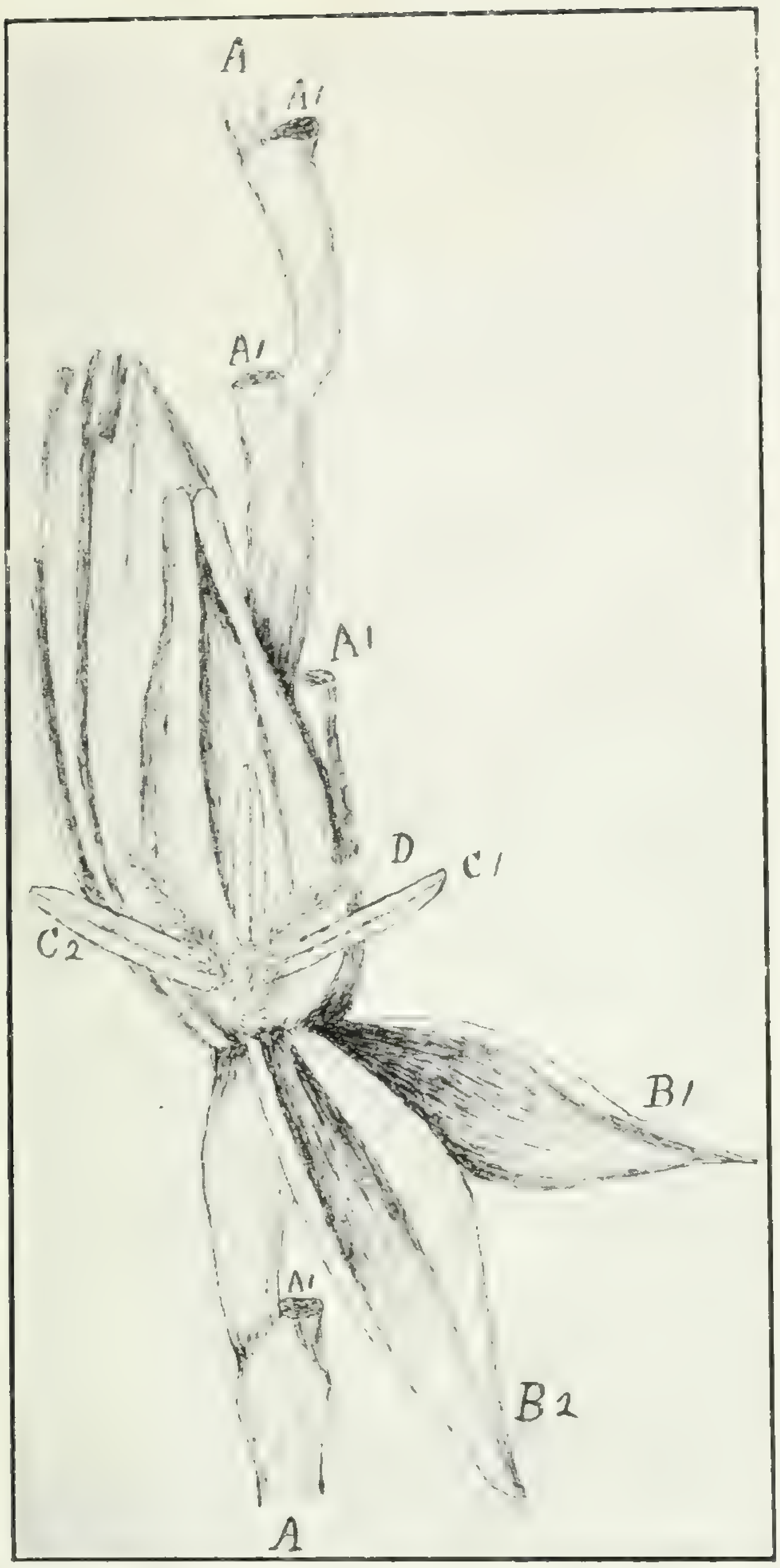


Fig. 1. Flower of Wheat magnified four diameters.

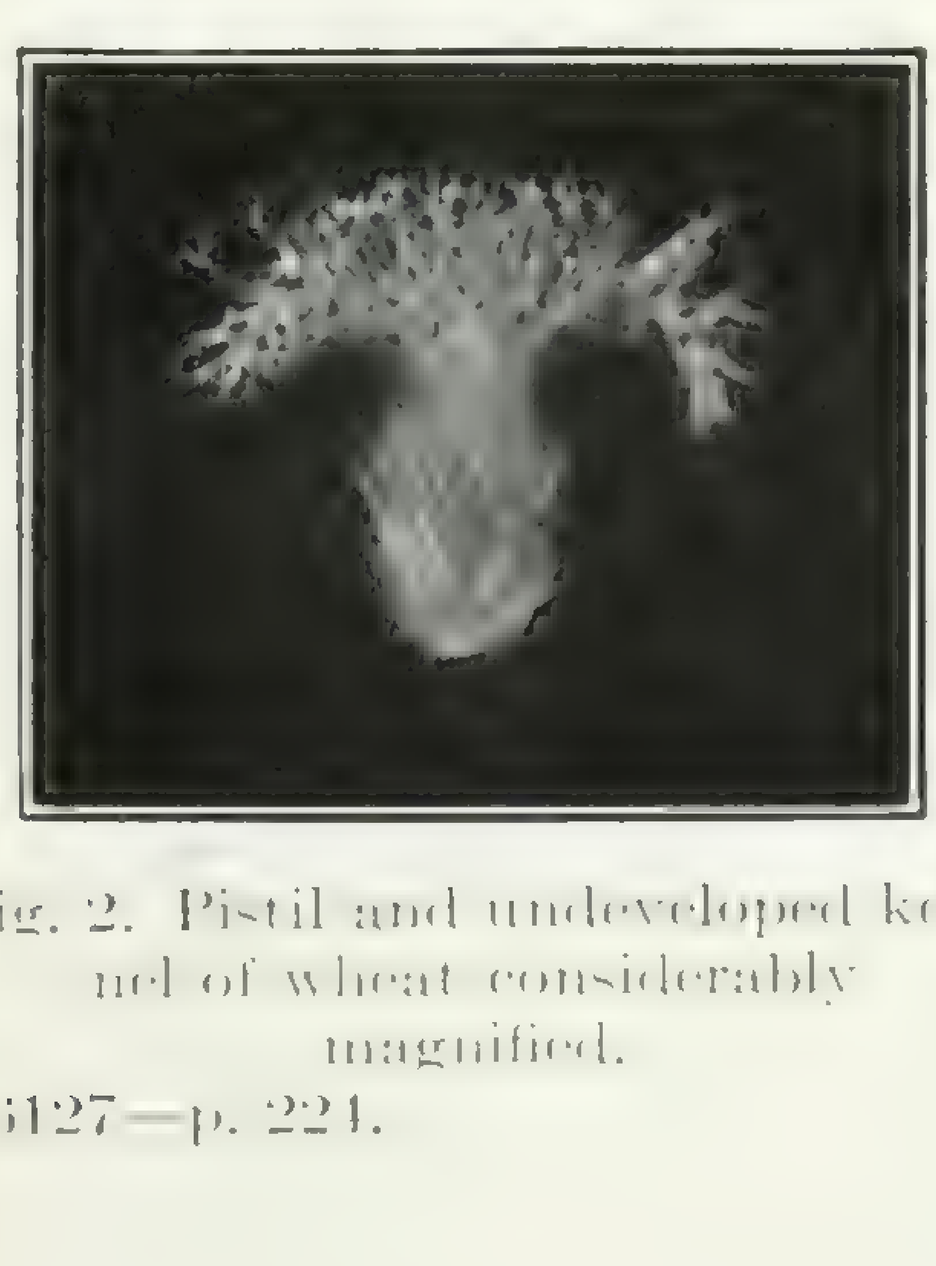


Fig. 2. Pistil and undeveloped kernel of wheat considerably magnified.

Fig. 3. Head of wheat with one flower naturally open.

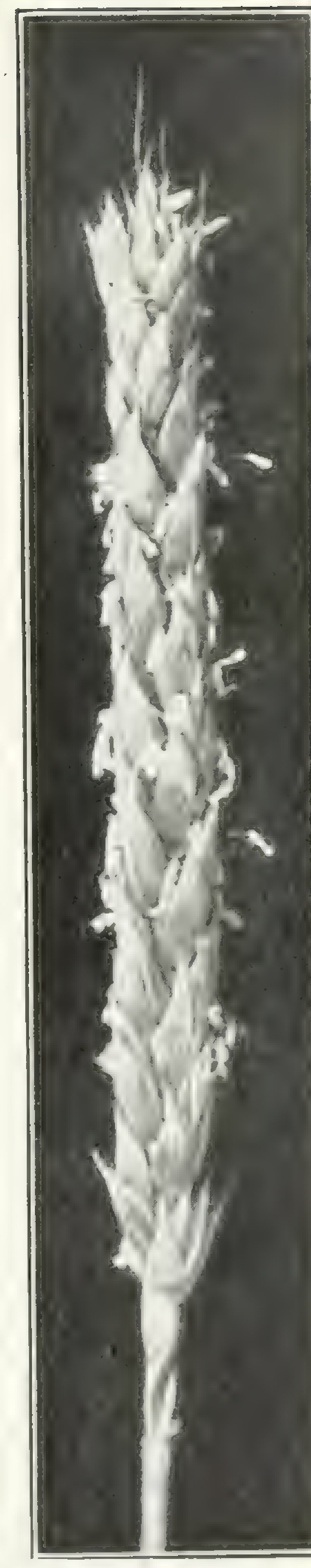


Fig. 4. Head of wheat "in blossom."

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Drawings and Photos by C. E. Saunders.

IMPORTANCE OF EARLY SOWING OF CEREALS.

Repeated tests have been made at this farm to ascertain the best time in spring for the sowing of cereals in order to obtain the largest possible yield. The experiments have proved that in this climate cereals should generally be sown about as soon as the land can be brought into proper condition. The reduction in yield due to delay in seeding is usually considerable, even when the delay is only a week long. The loss is especially serious with wheat and oats, and is sometimes quite disastrous in seasons when rust is abundant. The comparatively large yields obtained in the experimental plots on this farm are due in part to early sowing.

The best time for sowing cereals on this farm has been found to be from about April 20 to 26 in an ordinary season.

WEATHER.

The spring of the year 1907 was very backward, and the dates for the sowing of most of the plots were unusually late. Owing, however, to the continued cool weather for some time after seeding the conditions were favourable for the root growth of cereals, so that the crops reaped were on the whole very good. Some of the barley and wheat plots, however, suffered from excessive cold and moisture due to snow and rain early in May.

The summer and autumn were quite favourable, though, as usual, harvest operations here were interfered with by rain.

SPRING WHEAT.

The test plots of wheat were sown on April 29, the seed being used at the rate of about 1½ bushels per acre. The soil was chiefly a moderately heavy loam of good quality, but was somewhat variable in character.

The varieties with a letter after the name are new strains propagated from single selected plants. Varieties without names are new cross-bred sorts produced by the Cerealist, but which are not yet ready for distribution.

Among the new, selected strains attention is called to Red Fife B. This selection though not recorded as ripening earlier this season than any of the other strains of this variety has shown superior earliness in other years, and is, as a rule, distinctly earlier than ordinary Red Fife. In addition to its earliness it can be distinguished from ordinary Red Fife by the fact that the head of this wheat is somewhat blunt at the tip. The threshed grain is not distinguishable from the ordinary sort and shows fine milling quantities and very high baking strength. It is proposed to propagate Red Fife B as rapidly as practicable and to give it the name of 'Early Red Fife.'

A selected strain of early-ripening Red Fife was received about a year ago from Mr. Geo. L. Smith, of Saskatoon, Sask. A small plot of this wheat was grown at Ottawa this past season. It proved to be strikingly similar to Red Fife B and may perhaps be identical with it in all essential respects.

Some of the less important varieties have been discontinued. Haynes' Blue Stem (Minnesota No. 169) has also been dropped as it has been shown to be unsatisfactory for most of the wheat-growing sections of Canada, owing principally to its lateness in ripening.

The yield per acre is expressed in pounds and also in 'bushels' of 60 lbs.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Spring Wheat—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Chelsea*	Aug. 8.	101	40	Stiff	3½	2,700	45	..	61½	Slightly.
2	Herisson Bearded	" 12.	105	38	"	2	2,520	42	..	63	Considerably.
3	Early Russian*	" 8.	101	38	"	3	2,370	39	30	63	Slightly.
4	Persian Black	" 8.	101	38	"	3¼	2,370	39	30	60½	"
5	Prospect*	" 5.	98	37	"	3¼	2,370	39	30	61½	"
6	Pringle's Champlain C*	" 8.	101	38	"	3¼	2,280	38	..	62½	Considerably.
7	Aurora*	July 29.	91	33	"	2¾	2,280	38	..	63½	Slightly.
8	Bishop A*	Aug. 8.	101	38	"	3	2,280	38	..	62¼	Considerably.
9	Colorado	" 10.	103	44	"	3	2,220	37	..	63¾	Slightly.
10	Preston H*	" 8.	101	35	"	3¼	2,190	36	30	62	"
11	Yellow Cross*	" 8.	101	36	"	3	2,160	36	..	63½	"
12	10 F*	" 12.	105	50	Medium	3	2,160	36	.	59	"
13	Hungarian White	" 12.	105	39	Stiff	3	2,130	35	30	63	"
14	9 G*	" 12.	105	50	"	2½	2,100	35	..	58¾	"
15	Laurel*	" 12.	105	47	"	3¼	2,070	34	30	60	"
16	Yellow Queen*	" 8.	101	41	"	3	2,070	34	30	63½	"
17	Ebert Selected*	July 21.	93	34	"	3	2,010	33	30	63½	"
18	Red Fife B*	Aug. 13.	106	40	"	3	2,010	33	30	62	"
19	Huron Selected*	" 11.	104	40	"	3¼	1,980	33	..	63	"
20	White Russian	" 13.	106	40	"	3	1,980	33	..	59½	"
21	Alpha Selected*	" 9.	102	35	"	2¾	1,950	32	30	59½	Badly.
22	Gatineau*	" 12.	105	42	"	3	1,890	31	30	62½	Slightly.
23	Red Fern	" 12.	105	39	"	3½	1,830	30	30	61½	"
24	Red Fife M*	" 13.	106	40	"	3	1,800	30	..	60½	"
25	Bobs	" 9.	102	36	"	3	1,770	29	30	63	"
26	Red Fife H*	" 13.	106	40	"	3	1,770	29	30	60	"
27	Red Fife R*	" 13.	106	40	"	3	1,770	29	30	61¼	"
28	Red Preston*	" 11.	104	42	"	3¼	1,770	29	30	61	"
29	Riga M*	" 4.	97	30	Medium	2¼	1,740	29	..	63	"
30	Marquis*	" 12.	105	38	Stiff	3	1,710	28	30	62½	Considerably.
31	Colorado No. 50.	" 9.	102	35	"	2¾	1,680	28	..	61¼	Badly.
32	Spence Yellow*	July 31.	93	34	"	2¾	1,650	27	30	63	Slightly.
33	Preston A*	Aug. 10.	103	35	"	2¾	1,590	26	30	62	"
34	White Fife C*	" 16.	109	40	"	3	1,530	25	30	61½	"
35	Downy Riga D*	July 29.	91	28	Weak	2	1,500	25	..	63½	Considerably.
36	Stanley A*	Aug. 12.	105	37	Medium	3¼	1,500	25	..	59	Slightly.
37	Yellow Fife*	July 29.	91	32	Stiff	2¾	1,500	25	..	62½	"
38	Percy A*	Aug. 10.	103	33	Medium	2½	1,230	20	30	61	"
39	Outlook*	" 12.	105	37	Stiff	2¾	1,140	19	..	62	"

Most Productive Varieties of Spring Wheat.—Excluding the durum wheats, which are considered separately, the following important varieties of wheat have shown unusual productiveness for a series of years on this farm: Preston, Pringle's Champlain, Huron and Bishop. The first three of these are hard, red wheats with bearded heads. Bishop is a very early white wheat and is beardless. Of the four varieties Pringle's Champlain is probably the best for the production of strong flour.

Somewhat lower in yield but superior in the strength of their flour are Red Fife (beardless), Red Fern (bearded) and White Fife (beardless).

Earliest Varieties of Spring Wheat.—Several very early varieties of spring wheat are being grown on this farm, but they are not at present being distributed or recommended for general cultivation. Farmers applying for very early sorts should remember that extreme earliness is frequently associated with a rather small yield, short straw, liability to rust or some other defect to which the more vigorous wheats are less subject.

The earliest wheats which are as yet included in the regular distribution of seed grain from this farm are Pringle's Champlain, Preston, Huron, Stanley and Percy.

These are all somewhat earlier than Red Fife. Stanley and Percy are beardless sorts. Bishop, though earlier than any of these is not generally distributed because the pale colour of its bran would cause it to be graded below its actual value.

DURUM OR MACARONI WHEAT.

The different varieties of durum wheat are by no means identical in quality, though they are usually considered to be so. Some are particularly good for the making of macaroni, and excellent bread (of a rich yellowish colour) can be made from others, but many of the varieties are not good for either of these purposes. Kubanka (probably identical with Beloturka) is the best for bread making and probably for macaroni also.

The extreme hardness of these wheats and the yellowish colour of the flour produced from them make them quite unpopular at present with both millers and bakers.

Farmers who grow durum wheat should obtain one of the best varieties and should exercise great care to prevent the grain from becoming mixed with wheat which is to be sold for the making of ordinary flour.

As a rule the durum wheats suffer less from drought and from rust than other sorts. They may, therefore, prove useful in some cases, especially in any rather dry districts where rust is apt to be severe. They are not, however, to be recommended for damp climates. It should also be borne in mind that the market price of durum wheat is usually lower than that paid for varieties which are popular for milling purposes.

The plots of durum wheat were sown on May 3, the seed being used at such a rate as would be equivalent to 1¾ bushels per acre of seed of high vitality. The climate at Ottawa is usually too damp for these wheats and the seed saved is generally of rather low vitality. The soil was a loam of fair quality.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured Bushel after Cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Gharnovka..........	Aug. 13.	102	48	Medium..	2½	3,270	54	30	62½	Slightly.
2	Goose..........	" 13.	102	47	Stiff......	2¼	3,030	50	30	62½	"
3	Roumanian.........	" 17.	106	50	"	2½	3,000	50	..	63½	"
4	Cretan	" 17.	106	50	Medium..	2½	2,910	48	30	63	"
5	Beloturka	" 14.	103	48	" .	2½	2,880	48	..	61	Considerably.
6	Black Don............	" 14.	103	43	" .	2¼	2,610	43	30	61¼	"
7	Red Indian...........	" 13.	102	44	Stiff......	2¼	2,520	42	..	63½	Slightly.
8	Kahla	" 14.	103	42	"	2¼	2,460	41	..	59	Considerably.
9	Kubanka	" 14.	103	43	Medium..	2	2,430	40	30	62	Slightly.
10	Mahmoudi..........	" 17.	106	48	Weak	2¼	2,130	35	30	62¼	Badly.
11	Yellow Gharnovka....	" 17.	106	48	Medium..	2¼	1,950	32	30	62½	Slightly.
12	Velvet Don...........	" 17.	106	48	" .	2¼	1,680	28	..	61	Badly.

The variety called Roumanian has given the highest yield during the past five years. It is, however, of poor quality and should not be grown for any but feeding purposes.

WINTER WHEAT.

The plots of winter wheat were sown on August 29, 1906, the seed being used at the rate of about 1¾ bushels to the acre. The soil was a sandy loam.

Owing to the dry weather in September the young plants made only a medium growth and were not so high as usual when winter set in. Most of them, however, stood the winter very well and gave large yields. The yield per acre is expresssed in pounds and also in 'bushels' of 60 pounds.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured Bushel after Cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	American Banner. ...	July 27.	332	51	Stiff.. ...	3	3,750	62	30	62½	Slightly.
2	Red Velvet Chaff.....	" 29.	334	50	Medium..	3¼	3,420	57	..	60	Badly.
3	Abundance...........	" 27.	332	49	Stiff......	3	3,420	57	..	62¾	Considerably
4	Gold Coin......	" 28.	333	50	"	3¼	3,300	55	..	63	"
5	Imperial Amber	" 27.	332	52	Medium..	2¾	3,270	54	30	62	Slightly.
6	Dawson's Golden Chaff	" 27.	332	46	Stiff.. ...	3	3,150	52	30	62½	"
7	Tasmania Red........	" 27.	332	49	Medium..	3	2,880	48	..	64	"
8	Jones' Winter Fife....	" 28.	333	46	Stiff... ..	3¼	2,850	47	30	63	Considerably.
9	Early Red Clawson ...	" 26.	331	50	"	3¼	2,850	47	30	62	Slightly.
10	Reliable...............	" 26.	331	50	Medium..	3¼	2,820	47	..	64	"
11	Prosperity........	" 29.	334	46	Stiff......	3½	2,730	45	30	62½	"
12	Silver Sheaf	" 26.	331	53	"	3½	2,610	43	30	62	"
13	Invincible.	" 26.	331	45	Very stiff.	3¾	2,550	42	30	63	Considerably.
14	Padi......	" 29.	334	45	Stiff.....	3¼	2,550	42	30	61¼	Slightly.
15	Egyptain Amber. ...	" 29.	334	48	Medium..	3¼	2,520	42	..	62½	Considerably.
16	Early Windsor........	" 28.	333	42	Stiff......	3	2,520	42	..	63	Slightly.
17	Kharkov.......... .	" 26.	331	36	"	2½	2,520	42	..	64½	"
18	Turkey Red, No. 380..	" 27.	332	34	Medium..	2½	2,400	40	..	64¼	"
19	Red Chief....	" 27.	332	45	Stiff......	3½	2,100	35	..	61	Considerably.
20	Buda Pesth	" 31.	336	42	"	3	1,740	29	..	62¾	Slightly.

Recommended Varieties of Winter Wheat.—The climate of Ottawa being rather too severe for the regular production of satisfactory crops of winter wheat, the average yields obtained here would scarcely serve as a satisfactory guide for farmers in southern Ontario. Some recommendations in regard to varieties of winter wheat may, however, be given.

One of the best varieties in the field is Dawson's Golden Chaff (beardless). It has the disadvantage, however, of giving flour which is low in baking strength and therefore suitable for crackers, cakes, &c., but not for light bread. The gluten content of this variety is not high enough to make it quite satisfactory for the production of rolled wheat and other similar cereal products, though it is used for these purposes.

Turkey Red (bearded) yields the strongest flour, but does not as a rule give in Ontario as large a yield of grain per acre as some of the other sorts.

Egyptian Amber (bearded) and Tasmania Red (bearded) give good yields of grain and produce very good flour for bread making.

Imperial Amber (bearded) is another variety which can also be recommended both for its high yield and the very fair strength of its flour.

EMMER AND SPELT.

The plots of emmer and spelt were sown on May 10, the seed being used at the rate of about 120 lbs. (or four bushels by measure) to the acre. The soil was a rather light loam.

Common Emmer (often incorrectly called 'Speltz') is one of the best varieties, being less coarse and containing a larger proportion of kernel than most of the other sorts.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Lbs.	
1	Smooth Spelt	Aug. 28.	110	38	Stiff	3	2,850	29	Slightly.
2	Common Emmer	" 19.	101	45	Weak	1½	2,520	38	"
3	White Spelt	" 27.	109	38	Stiff	4½	2,430	27	"
4	Double Emmer	" 15.	97	40	"	2	2,310	28½	"
5	Red Spelt	" 28.	110	34	"	3	2,190	28½	"
6	9 K 2	" 15.	97	42	Medium	1¾	2,070	35½	Considerably.
7	Red Emmer	" 28.	110	36	Stiff	2½	1,950	32	Slightly.
8	White Bearded Spelt	" 26.	108	44	"	4	1,950	29	"
9	Thick Emmer	" 26.	108	36	"	2½	1,740	30	"
10	9 J 3	" 18.	100	50	Medium	3½	1,710	43½	Considerably
11	White Emmer	" 28.	110	36	Stiff	3½	1,410	28	Slightly.

OATS.

The plots of oats were sown on May 2 and 3, the seed being used at the rate of about 2 bushels per acre for most varieties, but in somewhat greater quantity whenever the oats were of unusually large size. The soil was a rather light loam.

The variety known as Columbus has been dropped on account of having rather weak straw. Other varieties are also being discontinued on account of their comparatively low crops.

The yield per acre is expressed in pounds and also 'bushels' of 34 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Improved American...	Aug. 13.	103	46	Stiff......	8	3,270	96	6	28½	Slightly.
2	Excelsior............	" 9.	99	42	Medium..	7	3,180	93	18	32½	Badly.
3	Gold Rain......	" 10.	100	50	" ..	7½	3,060	90	..	31½	Considerably.
4	Bergs (black).........	" 8.	98	50	Stiff......	7½	2,970	87	12	35½	"
5	Irish Victor	" 13.	103	48	Medium..	7½	2,970	87	12	31	Slightly.
6	Banner B*............	" 9.	99	45	Stiff. ..	8	2,940	86	16	31	"
7	Fichtel Mountain	" 11.	101	44	Weak	8	2,940	86	16	30	Considerably.
8	Abundance...........	" 15.	105	46	"	7¾	2,910	85	20	30	"
9	Daubeney Selected*...	" 3.	93	43	Medium..	6	2,910	85	20	32½	Slightly.
10	Garton's Abundance..	" 9.	99	45	Stiff	6½	2,910	85	20	34½	"
11	Green Russian........	" 10.	100	43	Weak	6¾	2,910	85	20	28	Badly.
12	Swedish Select... ...	" 8.	97	40	Stiff......	7	2,910	85	20	35½	Considerably.
13	Twentieth Century....	" 10.	99	43		7	2,910	85	20	34	Slightly.
14	Atlantic..............	" 9.	99	48	Medium..	8¼	2,850	83	28	32½	"
15	Siberian............ ..	" 11.	100	38	Stiff......	8	2,850	83	28	31½	Considerably.
16	Tartar King..........	" 8.	97	38	"	8	2,850	83	28	33	"
17	American Triumph....	" 11.	101	44	Medium..	7	2,820	82	32	29¼	"
18	Black Mesdag.........	" 3.	93	52	Weak	9	2,790	82	2	29	"
19	Swedish Ligowo	" 8.	97	37	Stiff	7	2,790	82	2	36	"
20	Banner A*..	" 9.	99	45	" . . .	8	2,760	81	6	31	Slightly.
21	Kendal Black*.......	" 13.	103	47	Medium .	8½	2,700	79	14	31½	Considerably.
22	Thousand Dollar.... .	" 10.	99	42	Stiff......	6¼	2,700	79	14	33½	Slightly.
23	Whiting.	" 13.	102	40	"	7¾	2,700	79	14	36½	"
24	Danish Island........	" 15.	105	45	Medium..	8	2,670	78	18	29½	"
25	Dinauer..	" 16.	106	50	Weak	8½	2,670	78	18	26	Badly.
26	Milford White*.... ..	" 13.	102	40	Medium..	8	2,670	78	18	29½	Considerably.
27	Tlola (black).........	" 3.	92	43	" ..	9	2,670	78	18	32½	"
28	Goldfinder............	" 18.	108	50	" ..	8	2,610	76	26	27½	"
29	Pioneer..............	" 9.	98	35	Stiff......	7¾	2,610	76	26	33	"
30	Sensation.............	" 9.	98	36	"	6½	2,610	76	26	34½	Badly.
31	American Beauty. ...	" 10.	100	48	Weak	8	2,580	75	30	30	Considerably.
32	Golden Fleece.	" 16.	106	50	Medium..	8	2,580	75	30	28½	"
33	Black Beauty.........	" 11.	101	47	Stiff......	9	2,550	75	..	30½	"
34	Golden Beauty.......	" 16.	106	40	"	6¾	2,490	73	8	30	"
35	Improved Ligowo.....	" 11.	101	47	Medium..	7¼	2,490	73	8	35	Slightly.
36	Kendal White*.	" 16.	105	46	Stiff......	8	2,490	73	8	30½	Considerably.
37	Mennonite.	" 10.	99	38	"	6¼	2,490	73	8	31½	"
38	White Giant Selected*	" 13.	102	36	"	6¼	2,490	73	8	32	"
39	Sixty Day...........	July 31.	89	31	Medium..	6	2,460	72	12	31½	"
40	Golden Giant.........	Aug. 19.	109	52	Weak	9	2,430	71	16	26½	Badly.
41	Wide Awake..........	" 13.	102	40	Stiff	7½	2,430	71	16	32¾	Slightly.
42	Early Ripe...........	" 3.	93	45	Medium .	5¾	2,400	70	20	29½	Considerably.
43	Bavarian....	" 11.	101	44	Stiff.. . ..	7¾	2,370	69	24	31	"
44	Lincoln.....	" 13.	102	43	"	7½	2,370	69	24	32½	"
45	Bell (black).......	" 15.	105	50	"	8	2,340	68	28	30	Slightly.
46	Storm King	" 8.	97	42	Medium..	8½	2,340	68	28	32½	Considerably.
47	Kirsche	" 15.	104	38	Stiff.. ...	7	2,250	66	6	31	"
48	Joanette (black).......	" 15.	105	37	"	7¼	2,220	65	10	33½	"
49	Chinese Naked., ...	" 10.	100	48	"	7½	2,190	64	14	47	"
50	Welcome............	" 10.	99	37	"	7	2,040	60	..	33½	"
51	Colossal...............	" 11.	101	48	"	8	1,950	57	12	31	Slightly.
52	Virginia White.	" 10.	99	40	"	7	1,950	57	12	32	"
53	White Wonder.	" 7.	96	42	Medium..	7	1,950	57	12	40¼	"
54	Sorgenfrei...........	" 9.	98	34	Stiff..	6¾	1,710	50	10	33½	Considerably.

Most Productive Varieties of Oats.—Among the most productive varieties of oats grown for the past five years at this farm the following sorts deserve special mention: Banner (sometimes called 'American Banner'), Twentieth Century, White Giant and Lincoln. These are all white oats, and one or more of these kinds can be obtained from any good seedsman. Golden Beauty and Mennonite are very productive yellow oats, but do not seem to possess any points of superiority over the best white oats. Among the black oats, Excelsior, a comparatively new variety, has given the highest returns at this farm.

Earliest Varieties of Oats.—The variety known as 'Sixty Day' is perhaps the earliest oat ever grown at this farm. Somewhat less early but probably more productive, as a rule, are Tartar King, Welcome and Daubeney. These are all white oats (except the Sixty Day, which is a mixture of white and yellow) and give a fair crop. They are obtainable in commerce, but farmers are not advised to grow them except in cases where earliness is of very great importance. The white oats mentioned in the preceding paragraph will generally be found more profitable.

SIX-ROW BARLEY.

In regard to the relative merits of the two strains of Chinese barley to which in Ontario the names *Mensury* and *Mandscheuri* are attached some explanation is required to rectify an incorrect impression which has been produced by some mis-quotation of the writer's words. These two strains have now been tested together for three seasons. The average yields show at present a return from the Mandscheuri of a little more than two bushels per acre in excess of the Mensury, chiefly, however, because, this past season, the latter variety happened to be unfortunately situated in regard to soil, as the quality of the land varied very much even in the small area required for the barley plots. By other workers the Mandscheuri has been shown to be very productive, especially in the drier parts of Ontario, but it has not yet been shown to have the general adaptability to varied conditions which the Mensury is known to possess. The comparative tests of these two varieties will be continued, and the new, selected strain of Mensury, which is being grown under the name of Manchurian and which gives promise of being superior to either of the other barleys, will be tested each year alongside of them.

The plots were sown on April 26, the seed being used at the rate of about 2 bushels per acre. The soil was a rather heavy but somewhat variable loam of good quality.

The yield per acre is expressed in pounds and also in 'bushels' of 48 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured Bushel after Cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Odessa	July 30.	95	32	Stiff	3½	2,610	54	18	48½	Slightly.
2	Stella*	" 30.	95	34	"	3¼	2,430	50	30	49	"
3	Blue Long Head	Aug. 1.	97	28	"	2¾	2,310	48	6	43	Badly.
4	Manchurian*	" 3.	99	37	Medium	3	2,310	48	6	45	Considerably.
5	Mandscheuri	" 3.	99	37	"	3	2,280	47	24	45	"
6	Nugent*	" 1.	97	32	"	3¼	2,250	46	42	49	Slightly.
7	Empire*	" 3.	99	36	Stiff	2¾	2,190	45	30	47½	"
8	Sisolsk	July 31.	96	33	"	2¾	2,100	43	36	46½	"
9	Oderbruch	Aug. 3.	99	30	"	3	2,040	42	24	48½	"
10	Bere	July 29.	94	32	"	3	1,950	40	30	47½	"
11	Summit*	Aug. 1.	97	35	Medium	3	1,920	40	..	47½	"
12	Black Japan	" 1.	97	25	"	2½	1,890	39	18	48	Badly.
13	Albert*	July 30.	95	35	Stiff	3½	1,710	35	30	46¾	Slightly.
14	Champion (beardless)	" 30.	95	39	"	2¾	1,680	35	..	43	Considerably.
15	Claude*	Aug. 3.	99	32	"	3	1,689	35	..	48½	"
16	Escourgeon	" 3.	99	34	Medium	3¼	1,680	35	..	49½	"
17	Hulless Black	July 31.	96	26	Weak	2	1,680	35	..	62	Badly.
18	Eclipse	Aug. 8.	104	32	Stiff	2¾	1,650	34	18	48	"
19	Mensury	" 2.	98	32	Medium	3	1,620	33	36	46½	Considerably.
20	Mansfield*	" 5.	101	35	"	2½	1,590	33	6	47	"
21	Small Blue Naked	" 2.	98	30	"	2½	1,590	33	6	56	Badly.
22	Trooper*	" 3.	99	32	"	3	1,530	31	42	46¾	Slightly.
23	Argyle*	" 3.	99	28	Stiff	2¾	1,230	25	30	47	Considerably.
24	Yale*	" 9.	105	28	"	2¼	750	15	30	47	Badly.

Most Productive Varieties of Six-Row Barley.—Among the most productive sorts which have been tested for several years at this farm are Mensury, Odessa, Nugent, Albert, Stella, Trooper and Blue Long Head. Mensury and Odessa are obtainable from most seedsmen in Canada.

Earliest Varieties of Six-Row Barley.—The differences in earliness among the varieties of six-row barley are not very striking. Among the earliest sorts are Mensury and Odessa.

Beardless Six-Row Barley.—Champion is the most productive variety of beardless barley that has been grown here. It ripens early, but gives a poor yield and is not to be recommended. It is obtainable in commerce.

Hulless Six-Row Barley.—The most productive variety of hulless barley which has been tested at this farm is Hulless Black. This is a bearded sort and can be obtained in commerce. It ripens early, but has weak straw and gives a small yield.

TWO-ROW BARLEY.

Two varieties of two-row barley *Caucasian Hulless* and *Early Chevalier* were added to the plots this season.

Caucasian Hulless is a bearded, hulless variety obtained from Russia. It has rather poor straw and is not a promising sort.

Early Chevalier is a selected, early strain derived from a single plant of French Chevalier which attracted the writer's attention in the year 1904 on account of its earliness and strength.

The plots were sown on April 27, the seed being used at the rate of about 2 bushels per acre. The soil was a rather heavy, but somewhat variable loam of good quality.

The yield per acre is expressed in pounds and also in 'bushels' of 48 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured Bushel after Cleaning.	Rusted.
				Inches.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Hannchen	Aug. 4.	99	31	Stiff	3½	3,090	64	18	50½	Slightly.
2	Swedish Chevalier	" 9.	104	34	Medium	4	2,610	54	18	49½	"
3	Hofbrau	" 9.	104	36	Weak	4½	2,520	52	24	48	"
4	Old Irish	" 5.	100	30	Stiff	4	2,430	50	30	49	"
5	Caucasian Hulless	July 30.	94	26	Weak	3	2,400	50	..	61	Considerably.
6	Early Chevalier*	" 28.	92	32	Stiff	4	2,370	49	18	50¼	Slightly.
7	Brewer's Favourite	Aug. 12.	107	30	"	3	2,340	48	36	48	Badly.
8	Canadian Thorpe	" 8.	103	30	Medium	3¼	2,310	48	6	48½	"
9	Clifford*	" 5.	100	38	Stiff	4	2,280	47	24	48½	Slightly.
10	Invincible	" 12.	107	30	"	3¼	2,250	46	42	47	Considerably.
11	Swan's Neck	" 5.	100	30	"	2¾	2,220	46	12	47	"
12	Primus	" 9.	104	36	Medium	3	2,190	45	30	49	"
13	Jewel	" 12.	107	30	Stiff	3½	2,040	42	24	44	"
14	Princess Svalof	" 12.	107	31	"	3½	1,980	41	12	48½	"
15	Jarvis*	" 5	100	37	"	4½	1,950	40	30	49	Slightly.
16	Standwell	" 9.	104	30	Medium	2¾	1,950	40	30	48½	Considerably.
17	Maltster	" 12.	107	31	Stiff	3	1,890	39	18	46¾	Badly.
18	Beaver*	" 3.	98	35	"	4¾	1,830	38	6	47	Slightly,
19	Danish Chevalier	" 9.	104	35	"	5	1,830	38	6	48½	Badly.
20	Erfurt White	" 9.	104	29	Weak	4¼	1,770	36	42	46¼	Considerably.
21	Princess	" 12.	107	30	Stiff	3½	1,740	36	12	48½	"
22	Dunham*	" 5.	100	37	"	3¼	1,650	34	18	47½	Slightly.
23	Logan*	" 8.	103	38	"	3¼	1,560	32	24	49	Considerably.
24	French Chevalier	" 9.	104	38	"	3½	1,320	27	24	48	Slightly.
25	Sidney*	" 9.	104	31	Medium	3	1,290	26	42	49	"
26	Gordon*	" 5.	100	37	"	2¾	1,230	25	30	48	"
27	Gambrinus	" 12.	107	30	Weak	3¾	1,050	21	42	44	Badly.
28	Archer Chevalier	" 13.	108	28	"	3¾	690	14	18	44	Considerably.

Most Productive Varieties of Two-Row Barley.—The following varieties of two-row barley have been found to be especially productive during the past few years at this farm: Standwell, Canadian Thorpe, Invincible and French Chevalier. The French Chevalier usually ripens a day or two earlier than any of the others mentioned.

Earliest Varieties of Two-Row Barley.—The earliest sorts among those tested for not less than five years at this farm are Beaver and Jarvis. These ripen usually about two or three days before French Chevalier. They give good yields but have not proved so productive as the French Chevalier.

Beardless and Hulless Two-Row Barley.—The varieties of beardless and of hulless two-row barley which have been tested at this farm have not shown sufficient strength of straw to make them profitable sorts for farmers to cultivate.

PEAS.

The plots of peas were sown on May 8, the seed being used at the rate of two or three bushels per acre, according to the size of the pea. The soil was a light, sandy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

* Varieties and selected strains produced at the Central Experimental Farm are marked with an asterisk.

PEAS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		Number of days Maturing.	Character of Growth.	Average Length of Straw.	Average Length of Pod.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Size of Pea
						Inches.	In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Nelson*	Aug.	16	100	Strong	55	2¼	3,030	50	30	63½	Medium.
2	Paragon*	"	25	109	"	65	2½	3,030	50	30	60½	"
3	Prussian Blue	"	20	104	"	75	2¼	2,820	47	..	63	"
4	Wisconsin Blue	"	25	109	"	50	2½	2,790	46	30	63	"
5	Early Britain	"	21	105	"	60	2	2,790	46	30	61	"
6	Mackay*	"	22	106	"	84	2½	2,640	44	..	62	"
7	White Marrowfat	"	19	103	"	70	2½	2,580	43	..	62½	Large.
8	Arthur Selected*	"	15	99	"	56	2¼	2,580	43	..	63½	Medium.
9	English Grey	"	22	106	"	76	2½	2,580	43	..	60½	"
10	Picton*	"	21	105	"	75	2	2,580	43	..	63	Large.
11	Daniel O'Rourke	"	20	104	"	65	1¾	2,520	42	..	63½	Small.
12	Prince*	"	28	112	"	75	3	2,520	42	..	62	Large.
13	Chancellor	"	16	100	"	68	2	2,490	41	30	63½	Small.
14	Prince Albert	"	28	112	"	75	2½	2,490	41	30	62	"
15	Canadian Beauty	"	19	103	"	75	2½	2,430	40	30	62½	Large.
16	Victoria*	"	22	106	"	72	2	2,430	40	30	61	Medium.
17	Zulu	"	22	106	Very str'g	90	1½	2,430	40	30	59	Large.
18	Gregory*	"	28	112	Strong	68	2½	2,400	40	..	62½	Medium.
19	Black-Eye Marrowfat	"	21	105	"	65	2¼	2,370	39	30	62	Large.
20	Archer*	"	25	109	"	60	2	2,280	38	..	62½	Medium.
21	Agnes*	"	21	105	"	70	2¼	2,250	37	30	62½	Large.
22	Golden Vine	"	28	112	"	60	2	2,040	34	..	63	Small.

Most Productive Varieties of Peas.—Among the most productive sorts of peas grown for the past five years at this farm are Golden Vine, Prussian Blue and Chancellor. One or more of these varieties can be obtained from almost any seedsman.

Earliest Varieties of Peas.—Chancellor and Prussian Blue are among the earliest varieties. Arthur is another early sort.

SPRING RYE.

Two plots of spring rye were sown on May 3, the seed being used at the rate of 1½ bushels to the acre. The soil was a rather heavy loam.

The yield per acre is expresssed in pounds and also in 'bushels' of 56 pounds.

SPRING RYE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	
1	Ottawa Select	Aug.	5	94	45	Stiff	3	1,950	34	46	57	Slightly.
2	Common	"	5	94	42	"	2½	1,470	26	14	57	"

WINTER RYE.

Three plots of winter rye were sown August 29, 1906, the seed being used at the rate of 1½ bushels per acre. The rye made fair growth in the autumn, stood the winter well, and gave a large crop of grain. The soil was a light loam.

The yield per acre is expresssed in pounds and also in 'bushels' of 56 pounds.

WINTER RYE—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Straw, including Head.	Character of Straw.	Average Length of Head.	Yield per Acre.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				Inches.		Inches.	Lbs.	Bush.	Lbs.	Lbs.	
1	Thousandfold........	July 29	334	65	Medium..	4	3,390	60	30	57½	Badly.
2	Dominion*..........	" 29	334	60	" ..	4½	2,940	52	28	58¾	Slightly.
3	Mammoth White....	" 29	334	64	" ..	4¼	2,790	49	46	59	"

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON SANDY LOAM.

These experiments were conducted on plots of one-sixtieth of an acre each. The oats were sown on May 10, and were ripe August 19. Those quantities of seed which have been clearly shown to be undesirable have been discontinued.

The results obtained this season are given in the following table:—

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.	Yield per Acre.	Yield per Acre.	
	Bushels.	Days.	Lbs.	Bush.	Lbs.
Banner oats..........	2	101	2,610	76	26
"	2½	101	2,760	81	6
"	3	101	2,910	85	20
"	3½	101	3,030	89	4

GRAIN SOWN IN DIFFERENT QUANTITIES PER ACRE ON CLAY LOAM.

These experiments were carried on like those on sandy loam. Those quantities of seed which have been clearly shown to be undesirable have been discontinued.

The oats were sown on May 11, and were ripe August 10. The results obtained this season are here given.

Name of Variety.	Quantity Sown per Acre.	Number of Days from Sowing to Harvesting.	Yield per Acre.	Yield per Acre.	
	Bushels.	Days.	Lbs.	Bush.	Lbs.
Banner oats..........	2	91	2,040	60	..
"	2½	91	3,030	89	4
"	3	91	2,580	75	30
"	3½	91	2,220	65	10

The average yields for the six years during which these experiments have been conducted indicate that there is no advantage in sowing more than 2½ bushels of Banner oats on clay loam in this climate. The experiments with the larger quantities of seed will therefore be discontinued.

FIELD BEANS.

Four plots, one-sixtieth of an acre each, were sown on May 25. The soil was a light loam.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds.

BEANS—TEST OF VARIETIES.

Number.	Variety.	Distance between Rows	Date of Ripening.	Number of Days Maturing.	Average Length of Straw.	Average Length of Pod.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
		Inches.		Days.	Inches.	Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Norwegian Brown....	16	Aug. 26..	93	12	5	3,600	60	..	60½
2	White Field.....	20	Sept. 21..	119	24	3½	2,640	44	..	63
3	Marrowfat..	20	" 18..	116	20	3½	2,550	42	30	63
4	California Pea Bean ..	16	Aug. 25..	92	18	3½	1,080	18	..	65

FLAX.

The plots of flax were one-sixtieth of an acre. The seed was sown on May 23 at the rate of 60 pounds to the acre. The soil was a rather heavy loam.

The yield per acre is expresssed in pounds and also in 'bushels' of 56 pounds.

FLAX—TEST OF VARIETIES.

Number.	Variety.	Date of Ripening.	No. of Days Maturing.	Average Length of Plants.	Yield per Acre.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
			Days.	Inches.	Lbs.	Bush.	Lbs.	Lbs.
1	Novarossick....	Aug. 19..	88	27	930	16	34	54
2	La Plata..........	" 19..	88	27	900	16	4	54¾
3	White Flowering......	" 13..	82	25	900	16	4	54
4	Yellow Seed.............	" 16..	85	30	840	15	..	54½
5	Riga.....	" 14..	83	28	750	13	22	55
6	Russian	" 14..	83	30	660	11	44	54¾
7	Common.............	" 15..	84	28	600	10	40	55

FIELD ROOTS.

The advantage of late pulling for field roots having been clearly proved by the experience of several years, comparative tests, by pulling on two different dates about two weeks apart, have been discontinued. All the roots were harvested at the one time, but the harvesting was left until quite late so as to enable the roots to make as large a growth as possible.

The yield per acre of the field roots is calculated from the weight of the crop gathered from one-hundredth of an acre.

The soil on which the field roots were grown was a heavy loam.

It is probable that in some instances varieties which are mentioned in these tables under different names are identical in all essential respects.

In Canada the ton contains 2,000 pounds.

TURNIPS.

Two sowings were made of each variety, the first on May 23 and the second on June 7. The seed was used at the rate of about four pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller, which flattened the drills nearly one-half, leaving a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows.

The roots were pulled on October 22.

Turnips—Test of Varieties.

Number.	Name of Variety.	Yield per Acre from 1st Sowing		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Hartley's Bronze	38	100	24	300
2	Hall's Westbury	36	1,500	23	700
3	Good Luck	35	1,400	20	500
4	Magnum Bonum	33	1,900	21	1,300
5	Mammoth Clyde	33	400	22	1,600
6	Jumbo	33	300	17	1,000
7	Halewood's Bronze Top	32	1,600	19	600
8	Kangaroo	32	100	21	1,500
9	Skirvings	31	800	18	..
10	Perfection Swede	31	400	21	900
11	Brown's Universal	30	400	23	1,700
12	Carter's Elephant	30	200	18	1,300
13	Bangholm Selected	28	1,000	19	200

The average yield from the first sowing was 32 tons, 1,692 pounds per acre.
The average yield from the second sowing was 20 tons, 1,815 pounds per acre.

MANGELS.

Two sowings were made of each variety, the first on May 23, and the second on June 7. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about seven inches apart in the rows. The roots were pulled October 21.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Gate Post	31	1,100	21	100
2	Selected Yellow Globe	30	600	22	400
3	Giant Yellow Intermediate	30	200	20	100
4	Prize Mammoth Long Red	29	200	20	100
5	Giant Yellow Globe	28	1,700	17	1,400
6	Perfection Mammoth Long Red	28	1,600	19	400
7	Crimson Champion	27	1,800	15	1,700
8	Yellow Intermediate	25	1,100	17	500
9	Mammoth Red Intermediate	23	200	19	900
10	Half Sugar White	18	300	18	200

The average yield from the first sowing was 27 tons, 680 pounds per acre.
The average yield from the second sowing was 19 tons, 180 pounds per acre.

CARROTS.

Two sowings were made of each variety, the first on May 23, and the second on June 7. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to make a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled October 23.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Improved Short White	30	900	22	1,000
2	Giant White Vosges	27	1,400	21	200
3	Ontario Champion	27	1,100	21	1,800
4	White Belgian	21	900	17	100
5	Half Long Chantenay	20	1,900	19	300
6	Mammoth White Intermediate	20	900	14	....

The average yield from the first sowing was 24 tons, 1,517 pounds per acre.
The average yield from the second sowing was 19 tons, 567 pounds per acre.

SUGAR BEETS.

Two sowings were made of each variety, the first on May 23, and the second on June 7. The seed was used at the rate of about six pounds per acre. Before sowing, the land was made up in drills two feet apart and rolled with a heavy land roller to made a firm seed bed. When the young plants were about three inches high they were thinned out, leaving them about five inches apart in the rows. The roots were pulled on October 23.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre from 1st Sowing.		Yield per Acre from 2nd Sowing.	
		Tons.	Lbs.	Tons.	Lbs.
1	Vilmorin's Improved	23	1,200	13	100
2	French Very Rich	21	....	16	400
3	Wanzleben	20	700	16	1,300

The average yield from the first sowing was 21 tons, 1,300 pounds per acre.
The average yield from the second sowing was 15 tons, 600 pounds per acre.

INDIAN CORN.

The corn was sown with the seed drill in rows thirty-five inches apart, and was also sown in hills thirty-five inches apart each way. When the plants were about six inches high they were thinned out, leaving them from six to eight inches apart in the rows, and leaving four or five plants in each hill. The seed was sown June 1, and the corn was cut green for ensilage September 28. The yield has been calculated from the weight of crop cut from two rows, each 66 feet long. The soil was a heavy loam.

For the making of ensilage the corn should be cut when the kernels are in the late milk or doughy stage; but the summer at Ottawa is not always warm enough to bring the later varieties to this state of maturity before it is necessary to cut the crop to avoid serious frost.

In Canada the ton contains 2,000 pounds.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
			Inches.			Tons.	Lbs.	Tons.	Lbs.
1	Eureka	Very strong	108	Very leafy	Early milk	27	120	23	1,410
2	Giant Prolific Ensilage	"	102	"	"	23	640	25	1,150
3	Superior Fodder	"	94	"	"	22	1,430	19	1,160
4	Wood's Northern White Dent	"	105	Leafy	"	21	1,560	17	1,530
5	Red Cob Ensilage	Strong	92	Very leafy	"	21	1,230	19	390
6	Early Mastodon	"	87	Leafy	"	21	900	17	980
7	Salzer's All Gold	"	100	Very leafy	"	21	350	22	110
8	Selected Leaming	"	92	Leafy	"	19	390	20	150
9	Early Butler	Very strong	102	Medium	"	17	430	18	1,510
10	Longfellow	Medium	88	"	Glazed	16	1,770	15	1,350
11	Champion White Pearl	Very strong	110	Very leafy	Early milk	16	1,110	18	300
12	Cloud's Early Yellow	Strong	87	Medium	"	16	1,000	20	1,140
13	Compton's Early	"	100	Leafy	Glazed	16	1,000	19	500
14	King Philip	"	97	"	Early milk	16	670	18	190
15	Mammoth Cuban	"	96	Very leafy	"	15	1,020	17	100
16	Early Leaming	"	92	"	Late milk	15	800	13	1,390
17	Angel of Midnight	Medium	88	Medium	Glazed	15	580	17	650
18	White Cap Yellow Dent	Strong	87	"	Late milk	15	360	16	450
19	Pride of the North	"	100	"	Glazed	14	1,480	13	1,500
20	North Dakota White	Medium	92	"	"	14	1,370	17	650

The average yield from the rows was 18 tons, 911 pounds per acre.
The average yield from the hills was 18 tons, 1,130 pounds per acre.

INDIAN CORN SOWN AT DIFFERENT DISTANCES.

Three varieties were chosen for this test: Champion White Pearl, Selected Leaming, and Longfellow. The seed was sown June 1, and the corn was cut for ensilage September 28. Sixteen rows of each variety were sown, that is, four rows at each of the distances mentioned, and the yield per acre has been calculated from the weight of crop obtained from the two inner rows in each case. The length of the portions of the rows cut for weighing was 66 feet.

Name of Variety.	Distance between the Rows.	Character of Growth.	Height when Cut.	Condition when Cut.	Yield per Acre.	
	Inches.		Inches.		Tons.	Lbs.
Selected Leaming	21	Strong	90	Early milk	20	824
"	28	"	92	"	18	96
"	35	"	92	"	18	1,950
"	42	"	108	"	19	1,574
Champion White Pearl	21	Very strong	108	"	22	37
" "	28	"	110	"	18	519
" "	35	"	110	"	18	520
" "	42	"	112	"	17	506
Longfellow	21	Medium	86	Glazed	15	807
"	28	"	88	"	15	1,584
"	35	"	88	"	16	560
"	42	"	96	"	18	754

FIELD PLOTS OF POTATOES.

As the experimental plots of field roots and fodder corn do not occupy the whole of the field in which they are placed, the remaining space is usually filled with potatoes, such varieties being grown as are likely to be of service in the annual distribution of samples from this farm.

The area devoted to the different varieties varies considerably. The plots are usually from about one-half to one and one-half acres in area.

The potatoes were planted May 28 to 31; and were harvested September 23 to 25. The soil was chiefly a moderately heavy loam.

The yield per acre is expressed in pounds and also in 'bushels' of 60 pounds. The yield given includes only the sound potatoes. There was not much loss from rot this season, but the crop of most varieties was very small.

No.	Variety.	Time of Maturing.	Colour.	Yield per Acre.	Yield per Acre.
				Lbs.	Bushels.
1	Gold Coin	Mid-season to late	White	12,000	200
2	Carman No. 1	" "	"	10,860	181
3	Everett	Early	Pink	8,340	139
4	Ashleaf Kidney	Mid-season to late	White	7,440	124
5	Dooley	" "	"	7,020	117
6	Early White Prize	Very early	"	6,540	109
7	Burnaby Mammoth	Mid-season to late	Pink and White	5,160	86
8	Burpee's Extra Early	Very early	White	5,100	85
9	Late Puritan	Mid-season to late	"	4,440	74
10	Rochester Rose	Very early	Pink	3,600	60

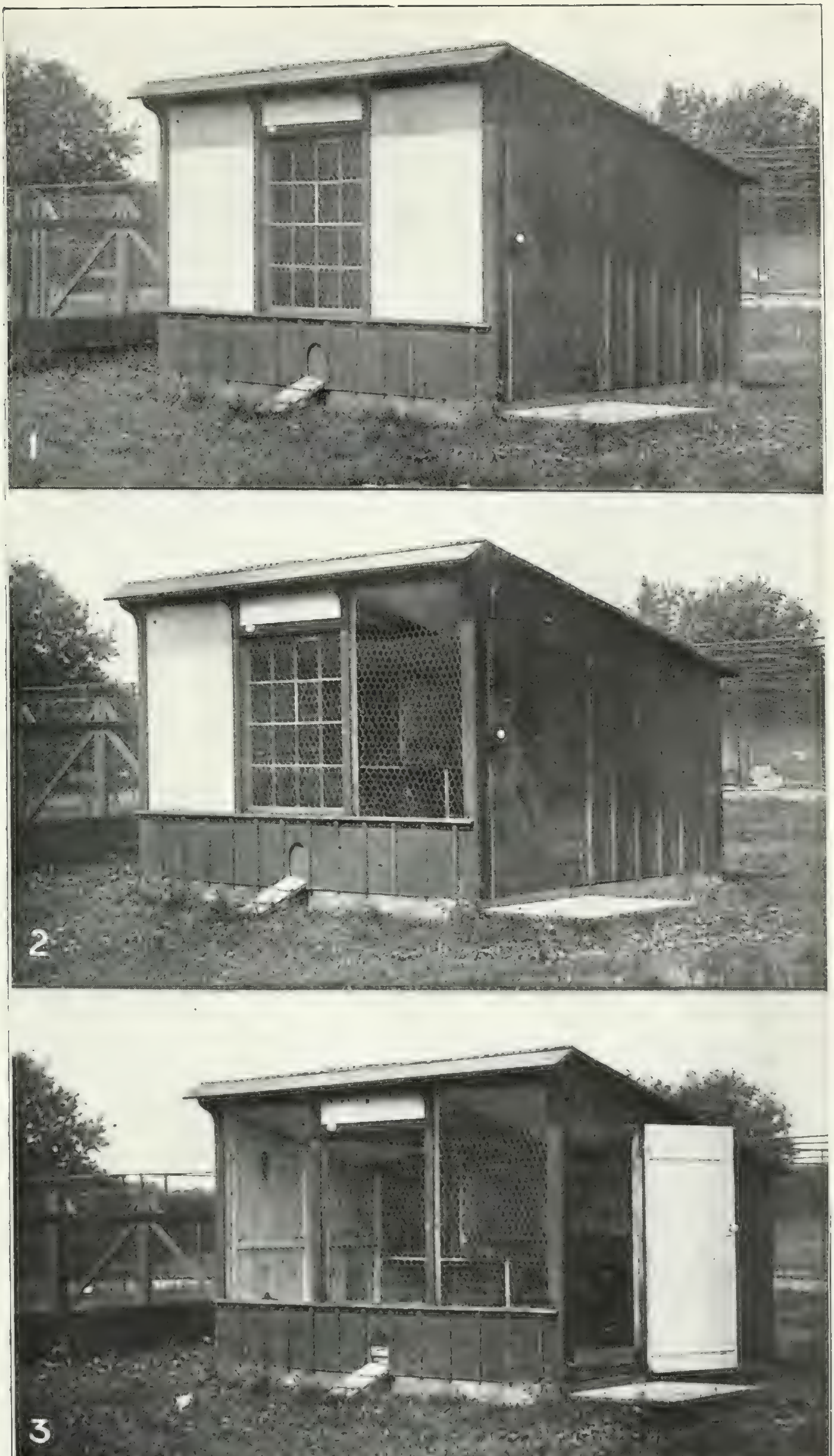

Plate 7—*Latest pattern cotton-front Poultry house.* Photo by Frank T. Shutt.
1. Showing cotton frames closed, as in winter.
2. One cotton frame open—a mild day in winter.
3. View of interior, as in summer.

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REPORT OF THE POULTRY MANAGER

(A. G. Gilbert.)

Dr. Wm. Saunders,
Director Dominion Experimental Farms,
Ottawa.

Sir,—I have the honour to submit herewith the twentieth annual report of the Poultry Division of the Central Experimental Farm.

The discussion of the changes made in recent years in the methods of housing our laying fowls in winter is continued from report of last year, and greater progress in this respect is noted. Particularly interesting is the endorsation, by a correspondent in Alberta, of the open front style of poultry house as suitable to the winter conditions of that province. Equally interesting is the description given by another correspondent, in the same province, of a poultry house made by him of sods, because of the high price of lumber.

Among other features of the experimental work of the year will be found the following, viz.:—

The trial during the past winter of low temperatures of a single-room poultry house which had a cotton front, facing south with window in centre. The cotton takes the place of boards and is the most advanced type of the open front pattern of house.

Results obtained in the building up, by trap nest selection, of prolific egg-laying strains of fowls.

Results in egg laying from fowls kept in partially warmed and unheated poultry houses.

A report by Dr. Higgins, Pathologist of the Biological Laboratory of the Health of Animals Department, on White Diarrhœa in chickens. This report is important and timely, for much discussion and investigation is taking place to determine, if possible, the exact nature of this disease which is so fatal to so many early hatched chickens in springtime throughout the country. Details of other experimental work during the year will be found elsewhere.

I have much pleasure in bringing to your attention the zealous and painstaking manner in which my assistant, Mr. Fortier, has discharged his duties during the past year. Notwithstanding that much of his time was taken up in handling a large and increasing correspondence in French, the compilation of the tables in this report relating to experimental work and the artificial hatching and rearing of chickens are the result of his careful effort. The small house with cotton front and window in the centre, which is fully described in the following report, was designed by the assistant poultry manager, Mr. Fortier. This house was first shown as part of the Experimental Farm exhibit at Sherbrooke, last year, where it was an interesting feature.

Mr. Summers has been energetic and correct in noting results by the trap nest system of selecting the best layers. He has also shown aptitude in the feeding of experimental rations and the hatching of chickens by hens and incubators.

Mr. Deavey was efficient in the feeding of the young and growing chickens, which after being hatched were placed in coops or brooders. The proper keeping of the different poultry houses and surrounding grounds was also entrusted to his care with satisfactory results.

A number of Farmers' Institute and poultry shows in different parts of the country were attended by Mr. Fortier and myself from time to time.

A large and increasing correspondence was an interesting feature of the past year and is a gratifying instance of the greater attention now being devoted to the poultry branch of farm work.

I have the honour to be, sir,
Your obedient servant,

A. G. GILBERT,
Poultry Manager.

REPORT OF THE POULTRY MANAGER.

In recent years changes more or less radical in their nature have taken place in the methods of breeding, feeding and housing of poultry. Many of these changes have been noted, as they occurred, in the annual reports of this Division. Perhaps no change has been more marked, or excited greater comment than that made in the style of winter house. The present day pattern of cotton front winter house, with or without scratch shed attachment, but with its free circulation of fresh air is certainly in marked contrast to the tightly closed up and ill-ventilated structures of former years. The trials of these modern style winter houses are being keenly regarded by poultry keepers who live in the cold winter districts of the Dominion, but markedly so by the numerous settlers in the provinces of Manitoba, Saskatchewan and Alberta who frequently inquire as to the adaptability of the cotton front house to their winter exigencies. In our Poultry Division different patterns of these cotton front, or, fresh air houses have been on trial for some years. The past three winters were notable for their low temperatures and afforded many opportunities for observation and record. The experience so gained permits of advice being given to inquirers, who live under similar winter conditions, that is calculated to be practical and helpful.

WHAT A POPULAR WINTER HOUSE SHOULD EMBRACE.

As shown by the letters received on the subject from correspondents, a winter house which would be suitable to the exigencies of the different provinces should be:—

A. Easily and cheaply constructed.

B. Arranged so as to keep the inmates in good health.

C. Well ventilated, dry and fairly comfortable. Which will be likely to permit of profitable egg yield.

Emphasis is to be laid on the result last named, for no matter how up-to-date the pattern of the house, or cheap its construction may be, if the fowls which tenant it do not lay a paying number of eggs during the winter season—the period of best prices—such pattern of houses will not answer. Are these requirements found in the cotton front house of latest design?

LATEST PATTERN OF COTTON FRONT HOUSE.

The latest design of this style of house has been on trial in our Poultry Division during the past winter and has given the most satisfactory results so far, as details given later on will show. This pattern of house has its whole southern front of cotton, instead of boards, with a window in centre. The argument is that ventilation without draft is secured by the diffusion of air through the cotton, while the sunlight—which is so desirable—finds its way through the window. Houses of similar design but without a window are seriously handicapped by having no provision for the inletting of the bright and enlivening sunshine. In this style of house there is only

one room, and it is both living and roosting apartment in one. It has no scratch shed attachment, but it embraces the scratch shed principle of affording floor space for the exercising of the fowls if they feel inclined to do so. This portion of the house is made with an air space of two inches, the other parts of the house is of rough boards. The roost room is at the north side of the house and in front of the roosting space is a cotton frame which is suspended from the roof during the day but is let down on cold nights, so keeping the birds comfortable, while ventilation is secured by the air finding its way through the cotton frame. To the side of the roosting space is a small pen which contains the male breeding birds. The screen also covers this enclosure. It is significant of the rapid changes which have recently taken place in the methods of housing and management of poultry to note that the house, with the much vaunted scratch shed addition, had hardly obtained a good footing when the latter was declared unnecessary and the present one room structure came into vogue. This one apartment may form a house of itself, or, it may be one of a continuous row as in the case of the poultry houses of the Pembroke Poultry Yards of Pembroke, Ont., and which plant was described in report of last year. The following are views of this latest arrangement of the cotton front poultry house.

THE COTTON FRONT HOUSE SEVERELY TESTED.

Has the trial of the foregoing cotton front house during winter practically demonstrated its usefulness? This is a question of the greatest moment to poultry keepers in connection with this style of structure.

A house of the description as shown in plate 7 No. 1 was erected and placed in position, near one of the main poultry buildings of our department, at the beginning of last November. In it were placed 20 Buff Orpington pullets and a cockerel. The latter was put in the enclosure to the side of the roost. These pullets were hatched between April 25 and May 28. As will be remembered, the past winter was noted for its low temperature and was well calculated to severely test this pattern of building. It should be stated that the pullet inmates of this house were the progeny of parent stock which had always been kept, during winter, in a warmed house. This really made the test more interesting. The egg laying record, as well as that of lowest and highest temperatures of the room and of the roosting pen during the night with the cotton frame down, for January, February and March are given as follows:—

Cotton Front House; facing south; unheated; contained 20 Buff Orpington Pullets, hatched between April 25 and May 28, 1907.

(Table 1.)

Month.	Eggs laid in Five Months.	Remarks.	
		Temperature of Room.	Temperature of Roosting Place.
1907.			
November	34	No Record	No record.
December	125	"	"
1908.			
January	230	Max., 24° above zero. Min., 22° below zero.	Max., 22° above zero. Min., 4° below zero.
February	160	Max., 24° above zero. Min., 22° below zero.	Max., 22° above zero. Min., zero.
March	222	Max., 54° above zero. Min., 6° below zero.	Max., 50° above zero. Min., 16° "

RATIONS GIVEN ABOVE PULLETS.

Morning and evening, whole grain ration composed of ½ wheat, ½ oats. Thrown in straw on floor.

At noon every third day, dry mash composed of 1 pint ground corn, one pint ground barley, 1 pint ground oats, 1 pint shorts, cut bone, beets. Given in a hopper.

Grit; oyster shells (ground), in constant supply.

Water supplied regularly. On very cold days snow was given.

DEDUCTIONS FROM ABOVE EXPERIMENT.

Observation showed the following interesting results from the above experiment, viz.:—

During the coldest nights of winter none of the combs of the birds were frozen. This was doubtless owing to the protection of the cotton frame which was put down in front of the birds when the nights were cold.

The birds were in good health during the winter. Their condition in spring time was excellent.

The fertility of their eggs in spring was convincing proof of the good health of the birds. On being tested, only 8 out of 70 eggs, which were put in an incubator on March 26, were found to be unfertilized.

The number of eggs laid during the five winter months named was fairly satisfactory considering the low temperatures frequently experienced and the non-stimulating, but wholesome rations given.

Another point worthy of note is the suitableness of the hopper system of feeding the dry mash during cold temperatures. Warm mashes would quickly have frozen, besides necessitating hot water (which means fire) and manipulation to mix them. Again, by the hopper and dry mash methods the birds had opportunity to take the mash when they felt inclined and each hen could get her full share. These are apparently matters of insignificant detail, but they all have important bearing on results.

OUTSIDE OPINION OF THE COTTON FRONT HOUSE.

The following are statements of outsiders living in cold districts as to the worth of this pattern of house. The first is a letter from a resident in Alberta who writes:—

CHEADLE, Alta., Jan. 27, 1908.

DEAR SIR,—I see by the papers that you are raising fowls by the cold house system. I am doing the same and am more than pleased with my success. I have wire screen doors and windows with burlap covering. Last winter the temperature often fell to 60° below zero, but all the damage was a few frozen combs. My 94 hens this winter which are in the same house, are strong and healthy and laying well. Next summer I intend to build a house with all the front wire netting and cotton covering. The trouble is that I know of no one experimenting on the same lines and from whom I can get cockerels to mate with my seasoned hens. I need B.P.R. cockerels for use in the breeding season. I do not keep male birds with my laying stock during winter. Can you supply me with two year old cock birds?

Yours truly,

(Sgd.) C. GRIFFITHS.

Mr. E. S. Turville, manager of the Poultry Department of the Free Hospital for Consumptives at Gravenhurst, Ont., writes:—

'Our poultry houses have cotton fronts with a window in the centre of each pen. I would not be without the windows for through them comes the sunshine in winter which is so beneficial. I have found the cotton front method most successful in keeping our fowls in good health and condition during the winter. The birds also

lay well. I have adopted the hopper system of feeding dry mash, but occasionally scatter whole grain in the litter on the floors of the pens to induce the fowls to exercise. If I can manage, I intend to have the floors of the pens of concrete instead of earth. I think the fresh air system most suitable to the proper keeping of poultry.'

A correspondent at Rising Sun, Alta., writes the following description of an open front house which he was building in April last. As he could not afford lumber his method of procedure may be useful to others similarly situated. He says:—

'DEAR SIR,—I thank you for opinion *re* suitability of open front poultry houses for this part of the country. I have not quite finished my house of open front pattern, but I may say that it is made of poplar logs with shed roof and south exposure. Front, 7 feet; back, 5 feet. The floor, which is gravel, is 26 feet long and 10 feet deep. There are three glass windows, 6 x 3, in front. Over the glass windows is a cotton frame 1 foot deep running the entire length of the building. The poplar logs average 6 inches. The roof is of sod, two layers with tar paper between. I shall 'mud' the logs with a mixture of clay and afterwards put sods on north, east and west sides of the building up to the roof, with a fence around to keep off the cattle, as I find they are never so happy as when trying to knock down sod buildings. I cannot afford to buy lumber, so I must do the best with materials at hand. I will be only too pleased to send you my experience with this style of structure.'

THE COLONY HOUSE PLAN—STRONG ENDORSATION.

The following letter from Mr. Elford, lecturer and poultry manager of the Macdonald College, Ste. Anne de Bellevue, Que., is strong endorsation of the colony house plan of keeping fowls in winter and securing profitable egg laying and good health of the birds. A colony house is a small, cheaply constructed, unheated house calculated to contain from 20 to 50 fowls. It is usually placed by itself in a small field, in extent an eighth to a quarter of an acre and which is surrounded by a close wire, or, other similarly constructed fence. Each house and ground, with its colony of birds, is independent of the others for the reason that each house contains roosts; nests and other necessary fittings. A farmer, who desired to keep only a small number of fowls, would find one house likely to answer his purpose. In our poultry division the colony house method has been found most satisfactory in rearing chickens, after they have been taken from their mother hens, or, the brooders. As in the case of the cotton front house, without scratch shed, the colony house is another advanced pattern of poultry building. It has been on trial at the Macdonald College for the past three years. Mr. Elford says:—

MACDONALD COLLEGE,
STE. ANNE DE BELLEVUE, QUE., February 11, 1908.

DEAR SIR,—I do not remember as much stormy and cold weather as we have had during the last two weeks. The thermometer went down to 36° below zero, which, in our exposed location, makes it very cold. I have been very much pleased, however, with the condition of the fowls throughout the cold weather. I do not think they have ever looked better, though the egg-yield has dropped a little during the cold spell. The houses inside were sometimes more than 20° below, but, with the exception of a few cockerels, no combs have been frosted. You know my continuous house, with its three-ply board and two of paper, without heat, however. The hens in the colony houses have done much better than they have in the continuous house. No matter when you went into the colony houses there appeared to be an absence of chilliness, and it felt home-like, which was lacking in the continuous house. I am even more satisfied with the colony house than I was last winter. To-day, which is the first moderate day we have had for several weeks, the hens are out bright and cheerful. Should this weather continue for long now, the egg-yield will come up rapidly.

I have often thought, from what I know of the Northwest and Manitoba climate that the colony house, such as I have here, is an ideal one for that country. I do not

care how cold it gets, good healthy, vigorous hens do not suffer, providing the place is dry and free from draft.'

FOR AND AGAINST RADICAL CHANGES.

Up to the present time our experience and that of many poultry keepers tend to show that the house of cotton front design in its varied styles satisfactorily conforms, under cold temperatures with the conditions already outlined, viz.: profitable egg yield; good health of fowls, stronger germs and cheap construction. But the advocates of a heated residence for the laying stock during winter, are yet numerous and their contention that it is quite possible to have fresh air, warmth, strong germs and a greater egg yield in winter is confidently advanced. When asked as to how the cost of a hot-water or hot-air system of heating is to be paid for, the answer is 'by an increased egg production.' A temperature of 60° is named as desirable.

And again there is another coterie of poultry keepers who ask from a humanitarian standpoint, 'are the cotton or open front pattern of house intended to see how much suffering from cold our fowls can endure and yet lay eggs?'

It will doubtless take several years of careful experiment and observation to decide the merits of the different systems so enthusiastically advocated and which are so extremely different. It is safe to say, meanwhile, that the system which permits of the greatest amount of profit, during the season of best prices, will be the one likely to be most in favour with those who desire to make money by the sale of eggs during winter.

OTHER EXPERIMENTAL WORK OF THE YEAR.

In early spring the different breeding pens were arranged as follows:—

		Cockerel.	Hens.
No. 1 House,	Pen 1.—Barred Plymouth Rocks	1	14
"	" 2.—White Plymouth Rocks	1	14
"	" 3.—Buff Orpingtons	1	14
"	" 4.—Buff Orpingtons	1	15
"	" 5.—White Leghorns	1	14
"	" 6.—White Leghorns	1	14
"	" 7.—Black Minorcas	1	14
"	" 8.—White Orpingtons	1	15
"	" 9.—Faverolles	1	9

House No. 2 contained spare cockerels for breeding purposes, to be used in case of necessity, also a pen of Black Hamburg hens and two pens of White Leghorns.

House No. 3,	Pen 20.—Light Brahmas	1 cock.	6 hens.
"	" 21.—S. G. Dorkings	1 cockerel.	9 "
"	" 22.—Mixed hens	1 "	10 "
"	" 23.—Crosses	1 "	7 "
"	" 24.—Mixed	1 cock.	8 "
"	" 25.—Barred P. Rocks	1 "	10 "

Cotton Front House No. 32 without Scratch Shed and Unheated.—Buff Orpingtons, 1 cockerel; 20 pullets.

Double House With Scratch Shed, Unheated.—Containing Pen 33, B. P. Rocks, 1 cock; 24 pullets.

Double House with Scratch Shed, Unheated.—Containing Pen 34, W. Wyandottes, 1 cock; 30 pullets.

Double House.—Containing Pens 35 and 36 with scratch shed of cotton.

Unheated.—Pen 35, Barred Puymouth Rocks, 1 cockerel; 18 hens.

" Pen 36, White Wyandottes, 1 cockerel; 14 hens.

For full description of this house see Bulletin 54; fig. 44.

The mixed hens in pens 22 and 24 and the cross-bred hens in pen 23 were made up for experimental purposes and eggs from them were not sold for breeding. As soon as the weather permitted the inmates of pens 7 and 14 were removed to colony houses in a field, much to the betterment of their condition.

ARTIFICIAL HATCHING AND REARING OF CHICKENS.

As has been shown in the reports of this Division for many years past, the germs of the early spring eggs were not strong enough to hatch out a paying percentage of chickens. This was particularly noticeable in the eggs laid by fowls kept in the warmed houses. The strength of the germs in the eggs laid in the canvas-front house has already been noted. The experience of recent years also strongly confirms the advice given to farmers, in reports of past years, not to hatch out chickens until their fowls have had a run outside in springtime. The best time to set eggs for hatching has been shown to be from 10th to 15th April. Chickens hatched in the first ten days of May are likely to grow more rapidly than those of an earlier date. No reference is made to fanciers who desire only a few choice specimens for show purposes and who are prepared to expend time and effort to obtain prize winners. In his evidence before the Agricultural Committee of the House of Commons in June, 1903, the following questions in relation to the number of eggs usually required to hatch out early spring chickens, were answered by the writer:—

'Mr. MACLAREN (Huntingdon).—Would it not be better for the party in question to sell his early spring eggs rather than lose so many in attempting to hatch chickens?

'Answer.—That is a fair question under the circumstances.

'Question.—Especially if he could get 45 cents per dozen for them?

'Answer.—That is a phase of poultry keeping that is receiving much consideration. I advise farmers to sell their early spring eggs and to begin hatching their chickens in the middle of April so as to have them, if possible, early in May. He should aim to have as many at one time as he can, and artificial means will enable him to do so.'

Experience has clearly shown that until the hens have had opportunity to run outside in early spring and the germs become strong, it is better for the poultry keeper to sell the eggs for eating purposes rather than to attempt to convert them into chickens. Where one hundred or more chickens are desired, a reliable incubator will be found the best means of hatching, and an up-to-date brooder the best way of rearing them. The following table, No. 2, shows the results of hatching by hens and incubators during the months of April and May last, in our department:—

TABLE NO. 2.—SHOWING RESULTS FROM EGGS HATCHED BY HENS.

Date.	Description of Eggs.	No. of Eggs set.	Eggs broken by Hens.	Clear.	Dead Germs.	Chickens dead in Shell.	Chickens Hatched.	Percentage of clear Eggs.	Percentage of Fertile Eggs.	Percentage of Chickens dead in Shell of Selected Eggs.	Percentage Hatched of Fertile Selected Eggs.	Percentage Hatched of Selected Eggs.
1907.												
April 16	Buff Orp., Hamburgs, Dorking, W. P. Rocks, and White Wyandottes.......	113	5	28	12	7	61	24¾	75¼	9½	90½	54
" 19	Buff and White Orp., S. G. Dorking, Faverolles and White Wyandottes ...	135	11	15	29	7	73	11	89	7½	92½	54¾
May 5	Faverolles, White Leghorns and White Wyandottes	75	3	4	5	9	54	5⅓	94⅔	13½	86½	72

EGGS HATCHED BY INCUBATORS.

Date.	Description of Eggs.	No. of Eggs set.	Clear.	Dead Germs.	Chicks dead in Shell	Chickens Hatched.	Percentage of clear Eggs.	Percentage of Fertile Eggs.	Percentage of Chicks dead in Shell of Selected Eggs.	Percentage Hatched of Fertile Selected Eggs.	Percentage Hatched of total Eggs set.	Remarks.
1907.												
April 15	B. P. Rocks, Buff & White Orpingtons.	49	7	10	7	25	14¼	85¾	20¾	79¼	51	These eggs were laid by hens kept in warmed houses.
" 15	B. P. Rocks & White Wyandottes	225	54	18	15	138	24	76	9¾	91¼	61	These eggs were laid by hens kept in unheated houses
" 28	B. P. Rocks, Buff Orp., Dorkings & White Leghorns ..	195	38	21	18	118	19½	80½	13⅓	86⅗	60½	These eggs were laid by hens kept in warmed houses.
" 28	B. P. Rocks & White Wyandottes	200	32	18	15	135	15	85	10	90	67½	These eggs were laid by hens kept in unheated houses.

PROGRESS OF THE CHICKENS.

The treatment accorded the chickens was much the same as in previous years. If hatched by incubators they were allowed to remain in the nurseries of the machines until strong on their legs, when they were removed to brooders outside. If hen-hatched they were removed, as soon as nest-ripe, with their mothers to coops with slatted fronts, which were placed on the grass in small fields adjoining the poultry buildings. Enquiry is frequently made by correspondents as to the proper food and management of chicks from time of hatching. The following method has been found most satisfactory in our poultry division in the case of incubator or hen-hatched chickens:—

Frst Day.—Very little food is required. It is important that the chicks at this time be well brooded, which means to be kept warm and dry. If chickens are sturdy and show desire for food give a few stale bread crumbs.

Second Day.—Give stale bread soaked in milk and squeezed dry. A little hard-boiled egg chopped fine may be added.

Third Day.—Add finely crushed wheat or granulated oatmeal to the foregoing, or give either singly, but in small quantity. Continue this for eight or ten days, when crushed corn may be added to the bill of fare. After twelve days, give whole wheat.

As the chicks grow older, feed a mash made of cornmeal, stale bread, shorts, ground meal, &c. Finely-cut green bone will be eaten with relish at this age.

For drink, give skimmed milk or water, or both. Grit of chicken size should be given from the first.

On the chickens becoming fully feathered, they were removed from the brooders to colony houses. The hens were removed from their coops at this stage, or perhaps earlier, and the chickens allowed to return to their coops until they grew too large for them when they were removed to colony houses.

SALE OF STOCK.

During the early fall the chickens were well matured, and spare cockerels of different varieties were disposed of to purchasers throughout different parts of the country.

TABLE 3.—WHEN THE PULLETS BEGAN TO LAY.

The pullets began to lay on the following dates:—

Pullets.	Hatched.	First Egg.
	1907.	1907.
Barred Plymouth Rock	April 5	August 26
Cross "	" 23	October 14
Buff Orpington	" 25	" 14
White Plymouth Rock	May 2	December 18
" Wyandotte	" 8	" 2
" Orpington	" 8	" 20
" Leghorn	" 10	" 4

NUMBER OF EGGS LAID DURING THE YEAR.

TABLE 4—The following number of eggs were laid during the several months of the year, as follows.

1907—	
April	2,873
May	2,248
June	1,046
July	1,025
August	1,364
September	412
October	326
November	144
December	1,062
1908—	
January	1,714
February	1,642
March	2,257
	16,113

BUILDING UP HARDY AND PROLIFIC EGG-LAYING STRAINS OF FOWLS.

WARM *VS.* UNHEATED HOUSES.

The work of building up hardy and prolific egg-laying strains of fowls was continued. Trap nests were used as the best means of distinguishing the good from the bad layers. At the same time opportunity was afforded to note the difference in the strength of the germs of the eggs laid by hens in the warmed and cold houses during early spring. Again the showing is in favour of the unheated house. Results are given in the following tables:—

TABLE 5.—PEN 1, WARM HOUSE.—Individual hen records as shown by trap nets; 13 Barred Plymouth Rock hens, two years of age.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1906		1907											
4	0	3	2	5	8	17	1	0	7	9	2	0	54	Broody once, used as setter from May 4 to July 8.
5	0	0	0	0	0	12	10	1	10	2	0	0	35	
6	0	15	0	6	16	14	5	7	3	0	1	0	67	Broody three times.
8	0	14	0	13	7	12	9	0	0	0	0	0	55	Broody once, used as setter from May 29 to June 20.
24	3	17	4	17	11	11	0	3	6	4	4	0	80	" " "
26	0	0	0	5	11	12	8	11	0	8	0	0	55	
68	4	9	5	15	5	10	7	8	6	1	0	0	70	Broody three times.
80	0	0	0	7	19	4	0	9	4	14	0	0	57	Used as setter from April 9 to June 17.
90	0	5	4	1	13	5	8	10	0	0	10	0	56	Broody once.
92	10	19	7	8	20	3	4	8	8	11	0	0	98	"
99	0	10	0	13	12	15	15	2	0	0	0	0	67	
33	0	13	15	9	8	11	13	12	7	8	0	0	96	Broody 4 times.
64	0	5	1	9	9	16	2	0	0	0	0	0	42	
	...	1	....	1	1	2	....	....	1	2	....	...	8	These eggs were laid on the floor.
Total..	17	111	38	109	140	142	82	71	52	59	17	0	840	Average 65 eggs per hen.

The best layers in the above pen were selected for breeding stock. Eggs were not sold for hatching from the poor layers.

RATIONS AND MANNER OF FEEDING THEM.

Whole grain.—$\frac{1}{2}$ oats, $\frac{1}{2}$ wheat. Thrown in litter on floor of house, morning and evening.

Cut green bone.—Every third day at noon.

Beets.—Every third day at noon.

Dry mash.—Composed of 1 part each of shorts, ground barley, ground oats and ground corn; beef scraps from 6th May in lieu of cut bone.

Grit, broken oyster shells and water in constant supply.

QUANTITIES FED AND THEIR VALUE.

Grain, 501$\frac{3}{4}$ lbs. at 1$\frac{1}{2}$ cents per lb.	$7 32
Mash, 98$\frac{1}{2}$ lbs. at 1$\frac{1}{2}$ cents per lb.	1 47
Bone, 31$\frac{1}{2}$ lbs. at 2 cents per lb.	0 63
Beets, 102 lbs. at $\frac{1}{2}$ cent per lb.	0 51
Grit (mica spar), 18 lbs. at $\frac{3}{4}$ cent per lb.	0 14
Shell, 18 lbs. at 1 cent per lb.	0 18
	$10 25

REVENUE FROM EGGS SOLD FOR EATING.

November and December, 1907, 10¾ doz. at 45 cents per doz. .	$4 85
January, 1908, 3¼ doz. at 50 cents, $1.63; February, 9 1/12 doz. at 45 cents, $4.08	5 71
March, 1908, 11⅜ doz. at 38 cents per doz.	4 31
April to October, 1908, 23 5/12 doz. at 25 cents per doz. . . .	5 85
	$20 72
Deduct.	10 25
Profit.	$10 47

Or, 80½ cents profit per hen.

Cost of feeding per hen per year, 79 cents.

TABLE 6, PEN 35.—Shows the number of eggs laid in a year by 18 Barred Plymouth Rock hens which were kept in Pen 35 of an unheated house. This house was divided into two pens numbered 35 and 36, respectively. Each pen had a scratch shed attached to it and each scratch shed had a front of cotton instead of boards. When constructed three years ago this house was made according to the most advanced design of the unheated house type, known at that time. Notwithstanding their cold habitation the fowls in this house gave better results than others in a heated building. Details are given in the following Tables, viz.:—

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1906		1907											
4	0	2	17	16	19	19	18	5	7	8	3	0	114	Broody twice.
12	0	0	9	1	13	11	10	4	0	0	0	0	48	
17	0	0	0	12	11	14	20	6	7	9	0	0	79	Broody once, in July.
19	0	0	22	21	9	13	14	9	0	8	0	0	96	Broody twice, in April and May.
26	0	0	4	11	10	19	9	0	0	0	3	0	56	
45	0	14	0	4	14	9	11	9	0	0	0	0	61	Broody twice, April and June.
50	0	5	15	17	18	12	12	7	0	1	3	0	90	
*55	0	1	5	0	9	7	15	4	0	1	0	0	42	
61	0	15	3	8	8	10	12	8	0	14	0	0	78	
63	0	1	10	13	14	15	16	5	0	0	0	0	74	Broody once.
67	0	1	6	0	8	15	13	5	11	9	0	0	68	" "
*73	0	3	2	5	9	7	10	4	0	0	0	0	40	" "
82	0	4	14	11	9	4	5	6	2	7	4	0	66	" three tin ,
90	0	2	17	8	10	12	12	5	0	0	0	0	66	
92	0	2	17	10	8	7	16	0	0	0	0	0	60	
*5	0	2	5	14	7	9	2	4	0	0	0	0	43	Broody once. Died June 8 Very fat.
72	0	8	14	6	12	12	16	8	4	11	0	0	91	
94	0	0	0	10	10	15	8	7	15	0	0	0	65	Broody three times.
	....	1	2	....	2	1	2	....	3	2	....	....	13	Laid in straw.
Total..	0	61	162	167	200	211	221	96	49	70	13	0	1,250	Average 70 eggs per hen.

*The hens marked thus were not used for breeding purposes nor were the eggs laid by them sold for hatching from. Hens Nos. 5, 72 and 94 were three years of age in spring, 1907.

RATIONS AND MANNER OF FEEDING THEM.

Whole Grain.—½ oats, ½ wheat; morning and evening. Thrown in litter on floor.

Wet Mash.—Composed of 2 parts shorts, 1 part ground oats, 1 part barley. Every third day at noon.

Cut Bone.—Every third day at noon.

Beets.—Every third day at noon.

Grit, broken oyster shells and water.—In regular supply.

QUANTITIES FED AND THEIR VALUE.

Grain, 740 lbs. at 1½c. per lb.	$11 10
Mash, 142 lbs. at 1½c. per lb.	2 13
Bone, 40 lbs. at 2c. per lb.	80
Beets, 162 lbs. at ½c. per lb.	81
Grit, 30 lbs. at ¾c. per lb.	23
Shell, 30 lbs. at 1c. per lb.	30
	$15 37

EGGS SOLD FOR EATING.

November and December, 1907, 5 1/12 doz. at 45c.	$ 2 28
January, 1908, 13½ doz. at 50c.	6 75
February, 1908, 14 doz. at 45c.	6 30
March, 1908, 16⅔ doz. at 38c.	6 38
April to October, 55 doz. 25c.	13 75
	$35 46
Deduct.	15 37
Net profit.	$20 09

Profit per hen of $1.11.
Cost of food per hen, 86 cents.

TABLE 7, PEN 36.—In this pen 36—which was the counterpart of and adjoining the preceding pen 35—were 14 White Wyandotte hens, the progeny of 13 hens, the laying record of which is shown on page 269 of 1906 report. The following table shows the benefit of breeding from selected good layers, the birds making a record of 104 eggs per year each, while the average of the parent stock for the same period was 74½ eggs each. Details are as follows:—

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1906		1907											
1	0	11	21	18	19	21	14	10	11	9	10	0	144	Broody twice. Died October 5.
3	0	0	0	4	19	11	13	10	8	9	1	0	75	Broody three times.
21	0	0	16	17	19	13	15	6	4	11	11	16	128	" once, in April.
23	0	15	20	14	17	19	22	11	12	12	1	4	147	" " Aug.
24	0	0	12	14	16	16	18	6	6	8	0	0	96	" twice, June and Aug.
35	0	0	0	13	13	8	13	5	7	8	1	0	68	" " "
43	0	3	15	15	17	17	21	6	5	9	0	0	108	
46	0	0	12	18	18	19	17	4	7	2	0	0	97	" once in Aug.
58	0	0	7	14	11	17	19	7	10	9	0	0	94	
71	0	0	0	19	8	18	18	6	13	8	1	0	91	
78	0	1	17	18	12	18	19	13	15	14	1	5	133	
19	0	1	21	10	11	10	11	0	0	7	15	13	99	" 3 times, Feb. Apr. & Aug.
73	2	17	15	1	6	13	19	13	8	13	2	0	109	
98	0	0	7	6	5	12	11	7	7	3	4	0	62	Same as hen No. 19.
						2	1		2			1	6	These eggs were laid on the floor.
Totals. .	2	48	163	181	191	214	231	104	115	122	47	39	1,457	Average 104 eggs per hen.

Hens 19, 73 and 98 were three years old in the spring of 1907.

RATIONS AND THEIR VALUE.

Whole Grain.—½ oats, ½ wheat; thrown in litter on floor morning and evening.

Cut Green Bone.—Every third day.

Beets.—Every third day.

Dry Mash.—Every third day. This mash was composed of 1 part each of ground oats, barley and corn, and 1 part beef scraps. The latter took the place of the cut green bone after May 6.

QUANTITIES FED IN 12 MONTHS WERE.

Whole grain, 596½ lbs. at 1½c. per lb.	$8 84
Ground grain, 122½ lbs. at 1½c. per lb.	1 83
Cut bone, 36½ lbs. at 2c. per lb.	78
Beets, 126 lbs. at ½c. per lb.	63
Grit, 30 lbs. at ¾c. per lb.	23
Oyster shells, 30 lbs. at 1c. per lb.	30
	$12 61

EGGS SOLD FOR EATING.

November and December, 1907, 4 2/12 doz. at 45c.	$1 87
January, 1908, 14 doz. at 50c.	7 00
February, 1908, 15 1/12 doz. at 45c.	6 78
March, 1908, 38 doz. at 38c.	6 08
April to September, 1908, 69 doz. at 25c.	17 35
October, 1908, 3¼ doz. at 33½c.	1 05
	$40 13
Deduct	$12 61
Profit	$27 52

Profit, $1.96 per hen.

Cost of feeding per hen per year, 90c.

Table 8, Pen 33.—This pen and the following one, 34, were under the same roof in an unheated house with scratch shed attachment to each pen. This house differed from the previous one, containing pens 35 and 36, in that there were no cotton fronts to its two scratch sheds. It was the first of the unheated houses erected some years ago. The inmates of this pen 33 were 23 Barred Plymouth Rock pullets hatched during the first three weeks of May. Results in egg-laying from November, 1906, to end of October, 1907, were:—

23 B. P. Rocks, pullets.	1906.		1907.										Total of eggs laid during the year.	Remarks.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
Total of eggs laid each month	4	45	109	143	219	278	280	*157	110	158	42	23	1,568	Average 68 4/23 eggs.

* On June 18, 1907, one hen died.

The parent hens of the above were also pullets, the history of which is shown on page 247 of report for 1905. The parent stock averaged for the year named 63¼ eggs per hen. In the above table the average is shown to be 68⅟23 per hen for the period recorded, a gain of 5 per cent.

RATIONS FED TO ABOVE PEN.

Grain.—½ wheat, ½ oats. Thrown in litter on floor morning and evening.

Cut bone.—Fed at noon. Every third day.

Beets.—Fed at noon. Every third day.

Wet mash.—Composed of 2 parts shorts, 1 part ground oats, 1 part ground barley, and 1 part beef scraps, after 6th May, in lieu of cut bone.

Value of the food consumed was	$19 05
Value of eggs sold during the year	39 45

Showing a profit of $20.40, or 87 cents per hen.

TABLE 9.—PEN 34.—In same house as the above pen 33. This pen contained 25 White Wyandotte pullets. The conditions as to temperature, food and date of hatching were the same as in the case of 33. The record of the parent hens as recorded on page 248 of 1905 report, showed an average of 62¾ eggs each per hen per annum. In the present case the pullets show an average of 74¾ eggs per annum per hen, which represents a gain of 12 eggs per hen per year, a decided improvement. Details of laying are:—

23 White Wyandottes, pullets.	1906. November.	1906. December.	1907. January.	1907. February.	1907. March.	1907. April.	1907. May.	1907. June.	1907. July.	1907. August.	1907. September.	1907. October.	Total of eggs laid during the year.	Remarks.
Total of eggs laid each month......	25	126	121	153	226	333	295	142	80	100	31	87	1,719	Average 74¾ eggs.

Cost of rations	$19 54
Revenue from sale of eggs.	45 97

Showing a profit of $26.43, or $1.15 per hen.

TABLE 10.—PEN 3, WARM HOUSE.—This table shows egg-laying results from 14 Buff Orpington pullets, kept in a warm house, for a year. It is interesting to note that these pullets were of the same age as Barred Plymouth Rock and White Wyandotte pullets, which were placed in pens 33 and 34 of an unheated house, and the egg-laying records of which are given in preceding tables 6 and 7. The rations fed were the same in both cases. The showing is in favour of the unheated house.

The Buff Orpington pullets, as will be seen from the following table, show an average of 52½ eggs each for the year as compared with an average of 68⅟23 from the Plymouth Rocks, and 74¾ each from the Wyandotte pullets. The egg record of the 14 Buff Orpington pullets is as follows:—

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1906		1907											
20	0	0	0	6	14	16	0	0	8	11	9	12	76	Used as setter from May 20 to July 20. Broody twice.
*30	0	0	0	1	4	6	0	0	0	0	2	6	19	Broody three times.
40	0	0	9	3	10	0	0	4	0	1	0	0	27	Broody once. Used as setter from April 4 to June 17. Broody twice.
*52	0	0	0	1	3	13	9	0	0	0	3	0	29	Broody once. Died Sept. 30.
56	0	8	12	8	2	5	5	0	8	1	0	0	49	Broody three times.
64	0	6	21	14	8	10	12	0	3	9	3	0	86	" four "
79	0	0	8	3	4	6	9	0	3	5	0	6	50	" five "
85	0	6	13	8	6	0	7	0	6	5	5	0	56	" six "
*87	0	0	0	0	8	6	4	0	2	5	0	0	25	Broody twice. Used as setter May 22 to July 25.
93	0	0	0	10	13	18	10	3	8	6	0	14	82	Broody twice.
48	0	0	15	13	1	15	0	0	6	10	5	10	75	" seven times.
60	0	2	1	4	5	5	0	0	0	1	0	11	29	" twice.
62	0	2	0	13	14	13	3	6	6	9	0	11	77	" four times.
*88	0	0	0	0	0	8	12	0	2	17	0	0	39	Showed no broodiness.
	0	1	1	1	4	....	3	1	....	....	...	2	13	Laid in straw.
Totals..	..	25	80	85	96	121	74	20	52	80	27	72	732	Average 52½ eggs per hen.

* Were not used to breed from; nor were eggs laid by them sold for hatching.

BREEDING FROM GOOD AND POOR EGG-LAYING STRAINS OF FOWLS.

The following tables record results which should be of unusual interest to all those who are engaged in the work of building up prolific egg-laying strains of fowls by selection of the best layers, and breeding from them. The tables convey the following lessons:—

First.—Results in breeding from good and poor egg-laying strains.

Second.—The advisability of breeding from none but trap nest selected birds.

Third.—The importance of having the male bird—which is often said to be half the pen—the descendant of prolific egg-laying hens.

In the first instance, four of the best and three of the worst layers were selected from a pen of 14 White Leghorn pullets. The record of these birds had been ascertained by the use of trap nests. The two groups of good and poor layers were put into separate pens, but side by side, numbered respectively 16 and 17. Conditions as to food and treatment were the same in both cases. Results are shown in the following tables:—

TABLE 11.—PEN 17.—Shows the eggs laid by the four best egg-layers referred to above, from November, 1904, to October, 1905, both months inclusive. The results in this table should be compared with those of No. 15, which gives a record of the three worst layers.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1904		1905											
11	0	0	17	16	16	22	21	14	4	5	0	0	115	
53	0	9	16	12	13	16	12	9	3	0	0	0	90	
63	0	0	14	15	18	18	21	17	4	0	0	0	107	
90	0	4	16	19	16	16	21	14	0	4	1	0	111	
Totals..	0	13	63	62	63	72	75	54	11	9	1	0	423	Average 105¾ eggs per head.

From the eggs laid by the four birds noted above, were hatched five pullets, the egg-laying record of which is shown in the following table:—

TABLE 12.—PEN 17.—Showing eggs laid by 5 pullets, the progeny of the hens noted in above table. Compare results in this case with those in Table 16, which gives egg-laying record of 5 pullets of poor egg-laying strain:—

FROM NOVEMBER 1, 1905, TO NOVEMBER, 1906.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1905		1906											
2	0	8	13	18	21	18	2	9	5	4	0	9	107	
11	0	12	17	12	5	12	6	9	0	0	0	4	77	
19	0	9	15	15	20	16	15	15	14	6	0	0	125	
43	0	8	7	12	20	14	12	10	10	0	0	0	93	
64	0	12	18	17	21	19	6	11	12	2	0	0	118	
Totals. .	0	49	70	74	87	79	41	54	41	12	0	13	520	Average 104 eggs per hen.

It will be noticed that the average number of eggs laid by each hen in the above and succeeding table is not as great as shown in Table 11, for the reason that a cock bird of unknown egg record was used.

TABLE 13.—PEN 17.—Shows the egg-laying record of the above 5 hens in their second year. Compared with Table 17.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1906		1907											
2	0	0	0	1	17	12	19	0	10	14	0	0	73	
11	0	0	0	0	10	16	15	2	0	0	0	0	43	
19	1	6	10	4	12	14	17	0	7	14	0	0	85	
43	0	0	0	10	17	12	15	3	7	14	0	0	78	
64	0	0	0	9	16	8	18	0	16	14	15	0	96	
Totals. .	1	6	10	24	72	62	84	5	40	56	15	0	375	Average 75 eggs per hen.

The inmates of the above pen were mated with a male bird from a family of good egg layers.

TABLE 14.—PEN 17.—Showing the record of six pullets hatched from the 5 hens, noted in the foregoing Table 13, for five months, or, until the 31st of March last, the end of the fiscal year. Compare with Table 18, which shows results from the same number of pullets, but of poor egg-laying strain:—

Hen No.	November.	December.	January.	February.	March.	Total of Eggs laid.	Remarks.
	1907.		1908.				
53	0	0	3	14	19	36	
66	0	8	19	15	18	60	
76	0	0	0	13	17	30	
83	0	3	1	15	18	37	
84	0	0	2	11	17	30	
96	0	5	16	15	19	55	
Totals......	0	16	41	83	108	248	To March 31, 1908. Average 41⅓ each of pullets.

BREEDING FROM POOR EGG LAYERS.

In the foregoing, Tables 11, 12, 13 and 14, are given results of breeding from fowls of good egg-laying record. The following tables show the deteriorating effects in egg laying, of breeding from one generation to another of poor egg layers. Comparing results of the different tables, the showing is much in favour of the good egg layers. The benefit of breeding from birds of established repute as good layers is strikingly instanced. In all cases except the first, as shown by the following Table 15, a male bird from a poor egg-laying strain was used to breed from.

TABLE 15.—PEN 17.—Showing the record of three poor egg layers selected from the same family from which came the inmates of Pen 17.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1904		1905											
34	0	0	4	6	9	10	14	9	2	0	0	0	54	
50	0	5	5	1	4	8	10	13	6	0	0	0	52	
65	0	0	1	0	2	14	20	12	4	0	0	0	53	
Totals..	0	5	10	7	15	32	44	34	12	0	0	0	159	Average 53 eggs per head.

This table should be compared with Table 11 of good egg-laying strain.

TABLE 16.—PEN 16.—Shows the egg-laying record of 5 pullets hatched from the three poor layers in above pen. The pullets were hatched on May 19, 1905.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1905		1906											
9	0	10	5	7	14	18	13	8	0	0	0	0	75	
18	0	7	13	8	11	14	13	9	12	6	5	7	105	
41	0	7	17	3	18	14	15	7	6	8	0	0	95	
47	0	0	1	6	6	7	4	10	0	0	0	0	34	
96	0	10	13	14	17	16	6	1	0	0	0	0	77	
	....	1	....	...	...	....	....	....	...	....	....	....	1	Laid on floor.
Totals..	0	35	49	38	66	69	51	35	18	14	5	7	387	Average, 77⅖.

Compare above results with those shown in Table 12 of good egg-laying strain.

TABLE 17.—PEN 16.—Shows the number of eggs laid by the above 5 pullets the year after when they were hens. Compared with Table 13 of good laying strain there is a falling off in the average number of eggs laid in the year.

Hen No.	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	Total of Eggs laid.	Remarks.
	1906		1907											
9	0	0	0	5	13	19	19	0	6	18	5	0	85	
18	5	5	14	8	9	16	9	6	8	7	0	0	87	
41	0	0	0	7	16	20	22	0	7	16	0	0	88	
47	0	0	0	0	5	8	10	0	0	0	0	0	23	
96	0	0	0	0	8	12	16	0	0	0	0	0	36	
	....	....	....	....	1	. .	...	....	....	....	....	....	1	Laid on floor.
Totals..	5	5	14	20	52	75	76	6	21	41	5	0	320	Average, 64.

TABLE 18.—PEN 16.—This table shows the egg-laying record of 6 pullets the offspring of the hens noted in Table 17, the preceding one. Results are given for 5 months, dating from November 1, 1907, to March 31, 1908, the end of the fiscal year. As compared with Table 14, showing results in egg-laying by the same number of pullets of good laying strain, the average number of eggs laid in the same period is much in favour of the birds bred from a good egg-laying strain.

Hen No.	November.	December.	January.	February.	March.	Total of Eggs laid.	Remarks.
	1907.		1908.				
1	0	8	6	10	12	36	
6	0	16	5	8	4	33	
13	0	0	0	5	17	22	
25	0	0	0	7	14	21	
52	0	0	0	0	0	0	
54	0	0	0	0	4	4	
Totals	0	24	11	30	51	116	To March 31, 1908. Average, 19⅓.

DEDUCTIONS FROM THE ABOVE EXPERIMENTS.

1. The tables recording the egg-laying results of the good layers should be compared with those noting results from the poor layers. The marked difference will be evident.

2. Results show very plainly the advisability—in building up prolific egg-laying strains of fowls—of breeding from none but birds of good egg-laying record.

3. Selection of a male bird from good egg-laying parentage is necessary to mate with hens of good egg-laying characteristics, if satisfactory progress is to be made.

4. Deterioration in constitutional vitality as well as number of eggs laid, followed the breeding from one generation to another of poor egg layers.

5. The falling off in the number of eggs recorded in Tables 9 and 10 is attributed to the mating with the parent hens from which the pullets descended, of a male bird of unknown pedigree. This emphasizes the advice given in previous reports to be careful in the selection of the male breeder.

6. Time, skilful selection, perseverance and patience are requisite in building up prolific egg-laying strains of fowls by method of trap-nest selection. At present this system, with its nests of various designs, appears to be the most certain in results.

TABLE 19.—This table shows the egg-laying yield in a year from 6 Black Hamburgh fowls. These fowls were placed during summer in a small colony house which was in the centre of a field where grass and clover were abundant. A certain amount of insect life could also be obtained. In winter the birds were placed in Pen 14 of No. 2 house, which during cold weather was warmed by a small stove. The good effect of the run in the field during the summer months was evident in the good condition of the birds at the close of the warm season.

Description of Hens. — Black Hamburgs. — Three Hens and Three Pullets.	1906.		1907.										Total of Eggs laid.	Remarks. — Two hens, 3 years old.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
Total of eggs laid each month.. ...	9	12	34	51	43	91	51	88	37	60	61	28	565	Average per hen $94\frac{1}{6}$.

TABLE 20.—Showing the beneficial results of allowing 6 Faverolle fowls to live in a colony house in a field, during summer, where they had a run, grass and insect life. In winter they were placed in Pen 7, in a partially warmed building.

Description of Hens. — Faverolles. — Three Hens and Three Pullets.	1906.		1907.										Total of Eggs laid.	Remarks.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
Total of eggs laid each month......	5	66	55	49	29	80	86	37	23	53	2	0	485	Average, $80\frac{5}{6}$.

TABLE 21.—PEN 22.—Shows unsatisfactory results from late hatched chickens. Eight chickens of B. P. Rock and White Wyandottes were hatched at the beginning of the month of July last, and did not begin to lay until the following February, when the high prices of November, December and January were declining. The moral is obvious. If desired for winter layers chickens should be hatched no later than the middle of May. Number of eggs and the months in which they were laid, are as follows :—

Description of Fowls. — Eight B. P. Rocks and White Wyandottes. — Pullets.	1906.		1907.										Total of Eggs laid during the Year.	Remarks.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
Total of eggs laid each month......	0	0	0	29	37	38	27	0	15	14	0	0	160	Average, 21.

TABLE 22.—PEN 23.—Records the eggs laid in a year by seven pullets of B. P. Rock and W. Wyandotte breeds. These pullets did not grow well notwithstanding that they were hatched in early May and were well cared for. Nor did they prove good layers. They were evidently constitutionally weak. It shows the necessity of a breeder knowing the quality of his breeding stock and the desirability of constitutional vitality in parents and offspring. Particulars are as follows:—

DESCRIPTION OF FOWLS. — Seven B. P. R. and W. Wyandotte Pullets.	1906.		1907.										Total of eggs laid during the year.	REMARKS. — Two of these hens laid only one egg each in the year and a third none.
	November.	December.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.		
Total of eggs laid each month......	0	0	7	12	29	35	26	0	6	4	0	0	119	Average 15½.

TABLE 23.—Shows the results of fattening good and bad types of chickens in crates and in pens with a limited run. By both methods the pure bred chickens made far greater gains than those of mixed breeds. Particulars are given in the following table:—

Pen or Crate.	Description of Breed.		Age.		Weight.								Food. Amount consumed in 4 weeks.				Remarks.
	Pure.	Cross.	Months.	Days.	August 3, 1907.		August 29, 1907.		Total gain in 4 weeks.		Average gain by chicken in 1 week.		Grain.		Milk.		
					Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Lbs.	oz.	Rations for each Group.
Pen....	4 cockerels	....	3	25	17	8	25	8	8	0	0	8	16	0	32	0	Ground oats 2 parts; ground barley 2 parts; mixed with skimmed milk.
" ...	....	8 cockerels	3	10	17	0	28	0	11	0	0	5½	20	8			
Crate...	5 cockerels	....	3	10	17	0	26	8	9	8	0	7½	21	0	41	0	
" ...	....	7 cockerels	3	10	14	0	23	8	9	8	0	5½	22	8			

LIST OF STOCK ON HAND MARCH 31, 1908.

Pen No.	Breed.	Cocks.	Hens.	Cockerels.	Pullets.	Total.	Remarks.
1	White Plymouth Rocks	1	......	......	22	23	
2	Buff Orpingtons	...	11	1	.....	12	
3	White Leghorns	1	12	......	......	13	
4	"	1	...	......	10	11	
5	Black Minorcas	1	10	......	2	13	
6	White Orpingtons	1	8	...	4	13	
7	Faverolles	1	3	......	8	12	
14	Black Hamburgs	.....	4	1	4	9	
16	White Leghorns	......	......	1	6	7	Poor egg laying strain.
17	"	......	......	1	6	7	Good " "
20	Light Brahmas	.....	4	1	2	7	
21	S. G. Dorkings	.....	6	1	3	10	
22	Mixed Pullets	.....	....	1	9	10	
23	Cross "	......	.....	1	7	8	
24	Mixed Hens	1	6	....	......	7	
26	Barred Plymouth Rocks	1	9	.....	.....	10	
32	Buff Orpingtons	......	......	1	20	21	Unheated house.
33	Barred Plymouth Rocks	..	....	1	23	24	" "
34	White Wyandottes	......	....	1	30	31	" "
35	Barred Plymouth Rocks	1	17	....	....	18	" "
36	White Wyandottes	...	16	1	......	17	" "
19	Silver L. "	....	4	....	.....	4	
	Capons	3	....	....	.....	3	In different pens.
	For breeding and eating purposes	......	.....	8	9	17	
	Totals	12	110	20	165	307	

EXHIBITION AT SHERBROOKE, P.Q.

At the Dominion Exhibition held in the city of Sherbrooke, Que., during the month of September an exceedingly interesting and instructive exhibition of poultry appliances was made. The display, which was in charge of Mr. Fortier, consisted of incubators and brooders in operation, representing the hatching and rearing of chicks by artificial means while hens setting on eggs rearing broods of chickens, represented the natural. A small cotton frame house—referred to in a previous part of this report—represented an up-to-date method of housing our laying fowls in winter. Trap nests, coops for rearing chickens, models of colony houses, wire coops containing fine specimens of the utility breeds, fattening crates, &c., demonstrated different phases of poultry keeping. The whole was arranged with excellent taste and was most favourably commented on.

WHITE DIARRHŒA OF YOUNG CHICKS.

The following remarks by Dr. Higgins, Pathologist, Biological Laboratory, in connection with the Health of Animals Department (Department of Agriculture), on White Diarrhœa of young chicks, will be found timely and useful. Dr. Higgins has had opportunity, during recent years, to examine many chickens suffering from this disease which has occasioned great loss to the poultry keepers of both Canada and the United States. Dr. Higgins is of the opinion that much remains to be discovered as to the exact nature of this fatal ailment. He thinks that the common term 'White Diarrhœa' has been used by different writers on the subject to designate a number of affections widely separated. These variations, he considers, are undoubtedly the source of much of the present chaotic state, in which we find ourselves, on the subject of White Diarrhœa. In his study of this affection, Dr. Higgins has used material from three outbreaks which has led to his forming certain opinions as to the cause of ailment in these cases. One early determination was that the ailment was not infectious, at any rate in one case, where chickens were placed in a brooder containing a large number of chickens affected with the disease. No effort was made to disinfect nor were any precautions taken to eliminate the disease from the brooder in question, had the affection been due to a specific infectious agent. Another conclusion arrived at, after careful investigation, is the 'White Diarrhœa' with which we are familiar, is due, not to an infective agent, but to a defective anatomical development prior to the emerging of the chick from the shell. Dr. Higgins is, however, unable to offer an opinion as to the exact cause of this defective anatomical development, but it is a fact that the chicks which he has examined, dead of the so-called 'White Diarrhœa,' have only a partial absorption of the yolk sac.

WHY THE DISEASE IS CALLED WHITE DIARRHŒA.

The reason given by Dr. Higgins for the designation of the disease as 'White Diarrhœa,' is interesting. He says: 'Normally this yolk sac is wholly absorbed at the completion of the period of incubation, or within the first few days after the chicks emerge from the shell. Where this sac is not absorbed 'White Diarrhœa' is extremely liable to make its appearance soon after the chick commences to eat, for this food fills the proventriculus, the gizzard and intestine. By the distention of the abovenamed organs with food the yolk sac is mechanically pressed against the cloaca or posterior portion of the bowel, rendering the passage of fœces to the vent impossible. No relief being afforded the chick dies of stoppage. The White Diarrhœa is merely a coincidence, occasioned by the fact that the ureters enter the cloaca from above and posterior to the point at which closure is caused by the pressure of the yolk sac, and

there being no obstruction they are easily voided. These urates are white and of semi-solid consistence, hence the name 'White Diarrhœa.'

From chicks dead of the so-called White Diarrhœa, Dr. Higgins obtained a variable bacterial flora, but he states, 'that it was impossible to associate any single organism with a series of cases.'

Another conclusion arrived at by Dr. Higgins is that the treatment of affected chicks offers little encouragement, for the reason that it is impossible to reconstruct the defective anatomy of individual chicks.

OTHER INVESTIGATIONS.

During the past year, Dr. Higgins has kindly made *post mortem* examination of fowls and young chicks which have died. The results of these investigations have been of much service to our Division.

EXPERIMENTAL FARM FOR THE MARITIME PROVINCES.

NAPPAN, N.S., March 30, 1908.

DR. WILLIAM SAUNDERS, C.M.G.,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit herewith my annual report of the operations on the Experimental Farm for the Maritime Provinces at Nappan, N.S., for the year 1907.

The summer of 1907 was by no means an ideal one for the Maritime Province farmers. The sowing of seed in the spring was much retarded owing to the cold and wet weather, and because of the shortness of our growing season this was a serious drawback. It was not until the end of June that seeding operations were completed. This, with the fact that the first frost occurred rather earlier than usual, left this year a particularly short season for farm crops.

Hay.—The leading crop in Cumberland county was considerably below the average. It suffered more than usual from being winter killed, especially in the newly sown fields. Up to July 1 this crop was extremely short, but from that date on a great improvement was made, fully one-third if not one-half of the total crop growing after that date. Rainy weather again settling in about this time, while it improved the crops made it especially hard to get hay gathered and much of it was spoiled, some very badly. All crops grew well in July and August, but by the end of the latter month it was found that the continued wet weather was a hindrance rather than a help, and in most cases grain did not ripen well, giving very moderate yields, with the grain rather light.

Mangels and turnips, while seeming to grow extra well at first did not do so well afterwards and the growth did not progress during the latter part of the season as well as usual, but notwithstanding this there was almost an average crop. Corn was the lightest crop for years, a cold and wet spring and a wet summer not being favourable conditions for successful corn growing.

Potatoes were a very good crop, at least up to the average and of good quality. Late in the season many sections were troubled with this crop rotting, particularly where spraying had been neglected, and which owing to the continued wet weather the farmers found it almost impossible to have done. Apples were hardly up to last year's crop, particularly the later varieties, early varieties were fairly good.

Pasture was considerably better than past seasons and consequently cattle were in better condition. Newly sown grass took particularly well, while the aftermath was very much better than usual, which is a very favourable condition for next year's hay crop. This added to the exceedingly high price for all farm products very largely offset the rather unfavourable season and with the farm work (fall ploughing, &c.) much better done up than last year, the prospects, with favourable weather conditions, for good crops next season are fairly bright.

I desire to acknowledge the services of Mr. J. Thomas Coates, foreman, and Mr. R. Donaldson, herdsman, and have been pleased with the interest they have taken in their work and the care with which they have discharged their respective duties.

WEATHER.

April, 1907, came in with a snowstorm. Snow fell on both the first and second, total snowfall for those two days, 6 inches. Snow fell on the 6th, and again on the 12th, 13th, 14th and 23rd.

Rain fell on the 5th, 9th, 24th and 26th. Thermometer registered from 1° to 23° of frost every morning of the first three weeks of this month, the highest temperature being 72° on the 30th.

May 1 and 2 were cloudy days, followed by clear weather, with the exception of a slight shower on night of 9th until the 11th, when from 10 to 12 inches of snow fell.

The balance of the month was cloudy and cool, with the exceptions of the 19th. 20th and 21st. The highest temperature this month was on Sunday, 19th, when 73° was recorded. Frost was registered on the 2nd, 3rd, 4th, 6th, 11th, 12th, 15th, 25th and 27th, the lowest being 5° on the 15th.

June was unusually wet and cold until the 18th. One degree of frost was registered each on the 5th and 10th, but no damage was done to plants. Rain fell on the 7th, 8th, 9th, 11th, 20th, 21st, 27th and 28th. The thermometer registered 81° on the 18th, 79° on the 21st and 81° again on the 23rd.

July.—The rainfall during this month was much heavier than usual, rain having fallen on 12 different days. The weather was dull generally, the thermometer registered 80°, 84°, 80°, 85° and 80°, respectively, on the 2nd, 5th, 19th, 20th and 29th.

August was also a dull and wet month, rain having fallen on 13 different days during this month, 2·51 inches having fallen on the 25th. The highest temperature was on the 1st, when 79° was registered.

September.—Heavy rains fell during this month, rain falling on 12 different days, making a total rainfall of 7·57 inches, the heaviest being on the 24th, when 2·56 inches fell. The highest temperature was 75° on the 12th and 2° of frost was registered on the 29th.

October opened with rain and rain fell on 16 different dates during the month a total of 8·42 inches falling. Frost was recorded on the 3rd and 4th, 2° each night, and again on the 10th, 3° was recorded. No more frost was recorded until the 19th, when we had 4°. On the 20th the thermometer dropped to 18° followed by a snowstorm, when 4 inches of snow fell. On the 21st, 22nd, 25th, 27th and 31st, the thermometer registered 2°, 7°, 5°, 8° and 5° of frost respectively.

November opened dull, with light rain falling on the 3rd, 4th, 7th, 8th, 10th, 11th and 12th. The balance of the month was fine and dry. Light frosts were recorded on the 1st, 2nd, 3rd, 6th and 12th, and on the 13th the thermometer dropped to 10° of frost, and kept dropping until the 18th, when 17° was recorded. Again on the 29th and 30th, 9° and 17°, respectively, was recorded.

December opened dull, followed by a snowstorm on the 2nd. Snow again fell on the 15th, 16th and 18th, giving one week's good sleighing, after which a two days' rain took all the snow away. The balance of the month was fine, until the 31st, when we had rain and snow in the morning, clearing at night. Frost was registered every day this month, with the exception of the 9th, 11th, 12th and 24th, the coldest being on the 27th, when the mercury dropped to 5° above zero.

January, 1908.—The first five days of this month were fine and cool, followed by snow on the 6th. The remainder of the month was somewhat broken, with many light snowfalls and light rains.

The thermometer registered on the 15th, 19th, 20th and 31st 2°, 3°, 5° and 8° below zero, respectively.

February.—A snowstorm on the 2nd and light snows on the 6th, 10th, 19th, 22nd and 24th, fell during this month.

The thermometer registered frost every night during this month, with the exception of the 15th, 16th and 28th. Rain fell on the 15th and 27th. This was the coldest month we had, the mercury dropped to 17° below zero on the 6th, which was the lowest temperature registered this winter.

March.—The first week in March was cold and rough, with north winds and snow flurries. The second week was fine. A heavy rain fell on the 14th, and a light rain on the 16th. The balance of the month was fine with the exception of the 27th and 28th, when rain again fell.

Frost was registered every night except on the 16th, 23rd, 24th and 27th, the coldest day being 7° below zero on the 6th.

METEOROLOGICAL RECORDS.

The maximum and minimum thermometrical observations for the year, from April 1, 1907, to March 31, 1908:—

Month.	Maximum.	Minimum.
1907.	°	°
April	30th, 72 above zero	8th, 9 above zero.
May	19th, 73 "	15th, 27 "
June	18th and 23rd, 81 above zero.	5th and 12th, 31 above zero.
July	20th, 85 above zero	5th, 46 above zero.
August	1st, 79 "	23rd, 42 "
September	12th, 75 "	29th, 30 "
October	8th, 65 "	20th, 18 "
November	3rd, 62 "	30th, 15 "
December	11th, 55 "	22nd, 5 below zero.
1908.		
January	8th, 55 "	31st, 8 "
February	27th, 52 "	6th, 17 "
March	23rd, 50 "	6th, 7 "

RAINFALL.

	Inches.
April, 1907	1·86
May, 1907	2·59
June, 1907	4·41
July, 1907	5·01
August, 1907	6·31
September, 1907	7·57
October, 1907	8·42
November, 1907	3·21
December, 1907	·83
January, 1908	1·13
February, 1908	3·91
March, 1908	2·86
Total	46·25

EXPERIMENTS WITH OATS.

Experiments were again conducted this year with the leading varieties of oats, which were grown in uniform test plots of one-fortieth of an acre each.

Thirty-one varieties were included in this test.

The plots received the same treatment and were on soil practically uniform throughout.

The ground was a clay loam on which corn was grown the previous year (1906) for which crop 20 loads of barn-yard manure per acre was used.

The land was ploughed in the fall. In the spring it was harrowed with the spring-tooth and smoothing harrows, until it was brought to a fine condition of tilth.

The seed was sown on May 21, with the seed-drill, at the rate of 2½ bushels per acre. The ground was also seeded down to clover and timothy at the rate of 7 lbs. Mammoth Red Clover, 3 lbs. Alsike clover and 12 lbs. Timothy seed per acre, sown by means of a grass seed attachment to the grain seeder. The oats was from selected heads of the previous season's crop, being cut from the various plots at harvest time.

No additional fertilizer was used on these plots. The grain started fairly well, but owing to the unseasonably cold and wet weather it made very poor progress, until about July 1, when conditions were more favourable, resulting in a fairly good crop. There was a considerable quantity of rust and some smut in these plots. The following yields were obtained:—

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
					Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Golden Giant	Sept.	16	118	46 to 50	Stiff	7 to 9	Sided	3,960	77	22	33
2	Tartar King	"	7	109	44 " 46	"	7 " 8	"	4,040	76	16	40
3	Improved American	"	10	112	44 " 48	"	6 " 7	Branching	3,880	75	10	34
4	Kendal White	"	10	112	42 " 46	"	6 " 7	Sided	4,080	74	24	36
5	Banner	"	7	109	44 " 47	"	6 " 8	Branching	4,200	74	4	35
6	Milford White	"	9	111	45 " 48	"	6 " 8	Sided	4,360	74	4	35½
7	Goldfinder	"	14	116	44 " 48	Medium	6 " 8	Branching	4,240	73	18	34½
8	Kendal Black	"	10	112	46 " 48	Stiff	6 " 9	Sided	4,280	72	32	36
9	Abundance	"	10	112	43 " 47	Medium	6 " 8	Branching	4 200	72	12	35
10	Golden Fleece	"	9	111	42 " 46	"	6 " 7	"	4,120	71	26	35
11	Black Beauty	"	10	112	44 " 48	"	7 " 9	"	3,880	71	26	34
12	Golden Beauty	"	10	112	44 " 47	"	7 " 9	"	3,560	71	26	33
13	American Beauty	"	9	111	44 " 48	Stiff	6 " 8	"	4,400	71	6	34½
14	Siberian	"	10	112	43 " 47	Medium	6 " 8	"	4,600	70	20	34
15	Joanette	"	9	111	40 " 44	"	6 " 7	"	3,640	68	28	34
16	Pioneer	"	9	111	43 " 46	Stiff	7 " 9	"	4,160	68	8	37
17	Virginia White	"	7	109	43 " 46	"	6 " 8	"	3,880	68	8	34
18	Danish Island	"	10	112	44 " 48	"	6 " 8	"	4,200	67	22	35
19	Bavarian	"	10	112	44 " 47	"	5 " 8	"	4,000	67	2	36
20	Twentieth Century	"	7	109	44 " 46	"	7 " 8	"	4,280	67	2	35
21	Storm King	"	7	109	44 " 47	"	7 " 8	Sided	4,280	65	30	40
22	Columbus	"	9	111	42 " 44	Medium	6 " 7	Branching	3,320	65	30	33
23	Improved Ligowo	"	9	111	44 " 48	Stiff	6 " 8	"	3,640	63	18	36
24	American Triumph	"	16	118	46 " 50	"	6 " 8	"	4,640	63	18	34½
25	Swedish Select	"	9	111	43 " 46	"	7 " 8	"	3,480	62	32	34
26	Sensation	"	7	109	44 " 46	"	6 " 8	"	3,680	62	12	35
27	Lincoln	"	10	112	42 " 44	"	5 " 7	"	3,800	61	26	38½
28	Wide Awake	"	10	112	40 " 42	"	6 " 8	"	3,760	61	6	37
29	Irish Victor	"	9	111	40 " 44	"	5 " 7	"	4,000	60	20	37½
30	White Giant	"	7	109	42 " 46	"	6 " 8	"	3,720	60		36
31	Thousand Dollars	"	9	111	43 " 46	"	7 " 8	"	4,200	60		34½

EXPERIMENTS WITH BARLEY.

Twenty-eight varieties of barley, fifteen of which were six-rowed, and thirteen of two-rowed, were sown in uniform trial plots of one-fortieth of an acre each. The land was a clay loam on which corn had been grown the previous year, 1906, for which crop barn-yard manure at the rate of 20 one-horse cart loads per acre had been used.

No other manure or fertilizer was used for this crop, This land was ploughed in the fall of 1906, and thoroughly worked up in the spring with the spring tooth and smoothing harrows, and sown on May 22, with seed selected from picked heads from

the previous year's crop, and sown at the rate of 2 bushels per acre, to which was added 7 lbs. mammoth red clover, 3 lbs. alsike clover and 12 lbs. timothy seed per acre.

Very little smut and practically no rust was observed.

The following tables give the yield obtained:—

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning
				Inches.		Inches.	Lbs.	Bush.	lbs.	Lbs.
1	Mensury	Aug. 31	101	32 to 35	Medium	2½ to 3	4,320	41	32	50
2	Empire	" 31	101	36 " 40	"	2½ " 3	4,120	40	40	51
3	Argyle	" 31	101	35 " 38	Stiff	2 " 2½	3,880	40		49½
4	Stella	Sept. 4	105	32 " 36	"	2 " 2½	4,040	38	16	51
5	Oderbruch	Aug. 28	98	35 " 38	Medium	2 " 2½	3,840	37	20	50½
6	Blue Long Head	Sept. 4	105	30 " 36	Stiff	2¼ " 3	3,800	36	32	44
7	Odessa	Aug. 28	98	35 " 40	"	2 " 2½	3,720	35	40	50
8	Nugent	" 31	101	35 " 39	Medium	2 " 2¼	3,920	35		49
9	Albert	" 31	101	38 " 41	Stiff	2 " 2¾	3,560	34	8	51
10	Trooper	" 31	101	38 " 42	"	2 " 2½	3,760	33	16	50
11	Yale	" 30	100	38 " 42	"	2 " 2½	3,800	33	16	49
12	Mansfield	Sept. 4	105	36 " 40	"	2 " 2½	3,640	32	24	49½
13	Claude	Aug. 31	101	33 " 36	Medium	2 " 2¼	3,480	31	32	49
14	Summit	Sept. 4	105	32 " 36	Stiff	2 " 2½	3,680	28	16	50
15	Champion	Aug. 28	98	40 " 42	Medium	2 " 3	3,420	27	24	45

TWO-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning.
				Inches.		Inches	Lbs.	Bush.	lbs.	Lbs.
1	French Chevalier	Sept. 6	107	34 to 38	Medium	3 to 3½	3,920	58	16	52
2	Danish Chevalier	" 6	107	34 " 38	"	3 " 3½	3,800	56	32	52½
3	Swedish Chevalier	" 6	107	32 " 36	Weak	3 " 4	3,520	47	24	53
4	Beaver	" 6	107	32 " 36	Medium	3 " 4	3,640	46	32	52
5	Dunham	" 4	105	44 " 48	Stiff	3 " 3¼	3,960	45		51
6	Canadian Thorpe	" 6	107	40 " 44	"	2½ " 3	3,880	44	8	51
7	Clifford	" 6	107	42 " 46	Medium	3 " 3½	4,040	43	16	51
8	Logan	" 4	105	44 " 48	Stiff	2½ " 3¼	4,120	42	22	50½
9	Standwell	" 6	107	40 " 44	"	2 " 2½	3,440	40		50½
10	Gordon	" 4	105	40 " 44	"	2 " 2½	3,160	36	32	52
11	Invincible	" 6	107	38 " 42	"	2 " 2½	3,080	34	8	51½
12	Sidney	" 6	107	38 " 42	"	2½ " 3	3,480	29	8	52
13	Jarvis	" 6	107	38 " 40	"	2 " 3	2,720	25	40	52

EXPERIMENTS WITH SPRING WHEAT.

Fourteen varieties of spring wheat were sown in uniform test plots of one-fortieth of an acre each. The land was a clay loam on which corn had been grown the previous year, 1906, and hay in 1905.

For the corn crop of 1906, 20 one-horse cart loads of barn-yard manure per acre had been used. The land was ploughed in the fall of 1906, and in the spring was well worked up with spring tooth and smoothing harrows, and sown May 20, at the

rate of $1\frac{3}{4}$ bushels per acre, together with 7 lbs. mammoth red clover, 3 lbs. alsike clover, and 12 lbs. timothy seed. The crop made fairly good growth throughout the season, but considerable rust was observed, principally on Preston, Huron, Hungarian White, Percy, Pringle's Champlain, Herisson Bearded and Red Fife.

The straw was stiff and stood up well in all cases except Hungarian White and Herrison Bearded, which were considerably lodged.

The following table shows the yields obtained:—

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Red Fern	Sept. 14	117	46 to 50	Stiff	3 to $3\frac{1}{2}$	Bearded	5,000	40	40	58
2	White Russian	" 16	119	46 " 48	"	3 " $3\frac{1}{2}$	Beardless	4,520	36	40	58
3	Preston	" 14	117	44 " 48	"	$2\frac{1}{2}$ " 3	Bearded	4,280	35	20	59
4	White Fife	" 16	119	46 " 48	"	$2\frac{1}{2}$ " 3	Beardless	4,120	28	20	58
5	Stanley	" 16	119	45 " 48	"	3 " 4	"	4,600	28	00	$58\frac{1}{2}$
6	Riga	" 9	112	45 " 48	"	$2\frac{1}{2}$ " 3	"	3,720	27	40	60
7	Huron	" 16	119	46 " 48	"	2 " 3	Bearded	4,480	27	20	$59\frac{1}{2}$
8	Hungarian White	" 11	114	42 " 46	"	2 " 3	"	3,920	26	40	$59\frac{1}{2}$
9	Percy	" 16	119	46 " 50	"	3 " 4	Beardless	4,800	26	40	58
10	Pringle's Champlain	" 11	114	46 " 48	"	3 " $3\frac{1}{2}$	Bearded	3,800	25	40	59
11	Herisson Bearded	" 11	114	42 " 46	Weak	$1\frac{1}{2}$ " 2	"	3,400	25	20	59
12	Red Fife	" 16	119	44 " 48	Stiff	3 " $3\frac{1}{2}$	Beardless	3,320	23	40	58
13	Colorado	" 10	113	46 " 48	Medium	$2\frac{1}{2}$ " 3	"	3,680	23	20	60
14	Bishop	" 10	113	46 " 48	Stiff	$2\frac{1}{2}$ " 3	"	3,640	22	40	59

EXPERIMENTS WITH DURUM AND MACARONI WHEAT.

Four varieties of Durum wheat were also sown on land, similar in character, and which received the same treatment as in the case of Spring Wheat. This was also sown on May 20.

Following are the yields obtained:—

DURUM WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				Inches.		Inches.		Lbs.	Bush.	Lbs.	Lbs.
1	Roumanian	Sept. 12	115	40 to 46	Medium	2 to $2\frac{1}{2}$	Bearded	4,280	32		60
2	Mahmoudi	" 11	114	40 " 44	"	$1\frac{1}{2}$ " 2	"	3,240	28		59
3	Yellow Gharnovka	" 12	115	42 " 46	"	2 " $2\frac{1}{2}$	"	2,840	25	20	59
4	Goose	" 10	113	40 " 44	"	2 " $2\frac{1}{2}$	"	3,080	24	40	60

EXPERIMENTS WITH EMMER AND SPELT.

Four varieties, two each of Emmer and Spelt respectively, were sown in plots of one-fortieth of an acre each. The land was a clay loam on which corn had been grown the previous year, and for which crop barn-yard manure at the rate of 20 one-

horse cart loads per acre was applied. This land was ploughed in the fall of 1906, and thoroughly worked up in the spring and sown May 20, with the drill seeder at the rate of 160 lbs. per acre.

The amount of seed and yield per acre from these plots is given in pounds as on account of the chaff not separating freely from the kernels, these grains cannot well be compared with other sorts of wheat by bushel, which have been threshed clean.

The following yields were obtained:—

EMMER AND SPELT WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw including head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.
				In.		In.		Lbs.	Lbs.
1	Red Spelt	Sept. 17	120	42 to 46	Stiff	3 to 4	Beardless.	4,900	2,040
2	Common Emmer	" 11	114	40 " 42	Medium	1½ " 2	Bearded	4,680	1,860
3	White Spelt	" 17	120	44 " 48	Stiff	3 " 4	Beardless.	4,400	1,800
4	Red Emmer	" 17	120	40 " 46	"	2 " 3	Bearded.	4,480	1,280

EXPERIMENTS WITH PEAS.

Twenty varieties of field peas were grown in uniform test plots of one-fortieth of an acre each. The seed was sown June 4, and cut from September 20 to 23. The vines made very good growth, but ripened very unevenly continuing to grow extremely late in the season.

The weather was very wet at this time and harvesting was delayed and an extremely violent storm of wind and rain coming when this crop was lying cut, mixed the whole of the varieties so badly as to make it impossible to report the separate yields. Consequently no details are given.

EXPERIMENTS WITH BUCKWHEAT.

Five varieties of buckwheat were sown in uniform test plots of one-fortieth of an acre each. The land was a heavy clay loam which had been in hay the previous year, 1907, and had received a dressing of barn-yard manure in 1904, when a crop of roots had been grown, followed by grain in 1905, no manure or fertilizer of any kind having been applied since. The land was ploughed in the fall and worked up well in the spring and the seed sown June 8, and harvested September 3.

The following yields were obtained:—

BUCKWHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw including Head.	Character of Straw.	Yield per Acre.		Weight per measured Bushel after cleaning.
						In.		Bush.	Lbs.	Lbs.
1	Silverhull	Clay loam.	June 8.	Sept. 3.	87	38 to 42	Stiff	45	40	52
2	Siberian or Tartarian	"	" 8.	" 3.	87	34 " 38	"	42	24	52
3	Rye Buckwheat	"	" 8.	" 3.	87	36 " 40	"	42	4	54
4	Japanese	"	" 8.	" 3.	87	40 " 46	"	41	32	50
5	Grey Buckwheat	"	" 8.	" 3.	87	36 " 40	"	38	16	51

FIELD CROPS OF GRAIN.

Five acres of field grain were grown in one acre plots. The land was a clay loam, and had been in roots the previous year, for which crop manure had been applied at the rate of about 20 tons per acre. The land was ploughed in the spring and well harrowed, after which mixed grain was sown with the seed drill at the rate of three bushels per acre. The mixture consisted of 2 parts of barley to 3 parts of oats, Mammoth Red Clover 7 lbs., Alsike Clover 3 lbs., and Timothy 12 lbs., per acre, was sown with this crop.

At no time did the crop look particularly promising, we believe this was due to the land having been ploughed in the spring instead of in the fall.

Following are the yields obtained:—

FIELD CROPS OF GRAIN.

Crops.			Yield per Acre.		Weight per Bush.
			Bush.	lbs.	Lbs.
1 Acre Odessa Barley	sown May 27,	cut Sept. 3	32	39	48
1 " Mixed Grain	" " 29,	" " 12	51		40
1 " Sensation Oats	" " 27,	" " 12	51	5	34
1 " Waverley Oats	" " 27,	" " 14	53	18	34
1 " Blk. Tartarian Oats	" " 27,	" " 16	52	18	34

FIELD CROP OF MIXED GRAIN.

Fifteen acres of mixed grain (oats, barley and pease) was sown in one field, 5 acres of which were ploughed in the fall, the remainder in the spring. The ground varied in character from clay loam to sandy loam. The seed was sown June 12 and 13. On the part ploughed in the fall there was a noticeably better crop than on the part ploughed in the spring, but on account of the extremely wet weather at harvest time, and this crop having to be cut entirely by hand, as horses and vehicles sank very deeply in this soil, it was not found possible to keep record of the separate acres. This crop was cut October 1 to 3, and gave an average yield of 31 bushels, 5 lbs. per acre.

EXPERIMENTS WITH LIME AND COMMERCIAL FERTILIZERS ON MARSH AND DYKE LANDS.

This experiment, which was carried on in 1906, was again repeated this season. The soil was what is generally considered sandy marsh, ploughed the previous fall and well worked up at seeding time with the spade, spring tooth and smoothing harrows Waverley oats were used for this experiment, sown broadcast and seeded with Clover and Timothy. The fertilizer and lime (air-slaked) was sown on the surface and harrowed in.

The plots were $\frac{1}{12}$ acre each.

This being a particularly good clover growing season in this section, no special difference was noticed in the clover take, all being good.

Size of Plot 1/12 Acre.	Fertilizer per Acre.	Yield per Acre, Grain.	
		Bush.	Lbs.
1	3 casks lime, 800 lbs. basic slag	40	9
2	3 " 400 lbs. bone meal	34	28
3	3 " only	34	6
4	3 " 400 lbs. Bowker's Fertilizer (Square Brand)	35	29
5	No lime, 800 lbs. basic slag	42	16
6	" 400 lbs bone meal	32	9
7	Check, no fertilizer used	25	12
8	No lime, 400 lbs. Bowker's Fertilizer (Square Brand)	29	8
9	6 casks lime, 800 lbs. basic slag	37	16
10	6 " 400 lbs. bone meal	48	18
11	6 " only	34	15
12	6 " 400 lbs. Bowker's Fertilizer (Square Brand)	38	20

The casks of lime used was the ordinary cask, in which lime is sold in this vicinity, weighing about 400 lbs., or 5 bushels.

Crop of Hay on Marsh, 1907, where Fertilizer Experiments on Marsh had been made in 1906.

Size of Plot 1/12 Acre.	Fertilizers per Acre used Previous Year, 1906.	Yield per Acre, Hay.	
		Tons.	Lbs.
1	3 casks lime, 800 lbs. basic slag	2	140
2	3 " 400 lbs. bone meal	1	1,780
3	3 " only	1	1,300
4	3 " 400 lbs. Bowker's Fertilizer (Square Brand)	1	1,000
5	No lime, 800 lbs. basic slag	1	904
6	" 400 lbs. bone meal	1	856
7	Check, no fertilizer used	1	1,120
8	No lime, 400 lbs. Bowker's Fertilizer (Square Brand)	1	400
9	6 casks lime, 800 lbs. basic slag	1	1,960
10	6 " 400 lbs. bone meal	1	1,900
11	6 " only	1	1,630
12	6 " 400 lbs. Bowker's Fertilizer (Square Brand)	1	1,420

FIELD CROPS OF GRAIN ON MARSH.

Two acres of oats were sown on ordinary marsh (or dyke) soil, rather inclined to be of a sandy nature, on which Timothy hay had been grown for at least ten years. This was ploughed in the fall previous, well worked up and sown by hand June 5, with Waverley oats, at the rate of three bushels per acre.

The total yield of grain being 68 bushels.

EXPERIMENTS WITH INDIAN CORN.

Twenty-one varieties of Indian corn were sown in uniform test plots, in rows 36 inches apart, and duplicates in hills 36 inches each way. The land was a clay loam in a good state of fertility, the previous crop having been clover hay. Stable manure at the rate of about 20 tons per acre was spread on the sod in the fall of 1906, and ploughed under, together with a crop of grass already grown in the spring of 1907. To this was added Bowker's commercial fertilizer at the rate of 400 lbs. per acre sown broadcast and harrowed in. This crop was sown June 14, and when the plants were about 6 inches high they were thinned out to from 4 to 6 inches apart in the rows,

and from 3 to 6 plants per hill, when in hills. The land was gone over with a light smoothing harrow before the plants came up, and once each week for the next five weeks. Owing to the continued cold and wet weather this crop made particularly poor growth all through the season, and was consequently in bad condition to withstand the unusually early frosts in the latter part of September and early part of October. This was the poorest crop of Indian corn grown here for many years. The yield per acre both in rows and hills has been calculated form the weight of crop from two rows, each 66 feet long.

The following were the results obtained:—

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Height.	Leafiness.	When Tasselled.	Condition when cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		Inches.				Tons.	Lbs.	Tons.	Lbs.
1	Giant Prolific Ensilage	66	Leafy	Sept. 25	Tasselled	13	950	12	200
2	Eureka	72	Fair	" 25	"	13	730	14	700
3	Early Longfellow	73	Leafy	Aug. 25	Watery	13	180	9	1,930
4	Salzer's All Gold	74	Fair	Sept. 25	Tasselled	12	1,850	9	1,580
5	Early Mastodon	84	"	" 12	Silking	12	1,300	10	20
6	Mammoth Cuban	75	"	" 3	"	12	750	9	1,800
7	Red Cob Ensilage	70	"	" 25	Tasselled	11	1,870	12	750
8	Longfellow	72	Leafy	Aug. 25	Watery	11	1,650	11	....
9	Early Leaming	73	Fair	Sept. 5	Silking	11	1,650	8	170
10	Champion White Pearl	90	"	" 5	"	11	1,430	8	830
11	Early Butler	66	"	" 5	"	11	550	11	330
12	Wood's Northern Dent	66	Leafy	" 12	"	10	1,450	11	550
13	Superior Fodder	68	Fair	" 25	Tasselled	10	900	9	1,250
14	Selected Leaming	75	"	" 5	Silking	10	570	9	1,800
15	King Philip	74	Leafy	" 3	"	10	570	8	500
16	North Dakota White	72	"	Aug. 25	Watery	9	1,910	10	680
17	Angel of Midnight	72	"	" 25	"	9	1,580	10	900
18	Compton's Early	70	Fair	" 27	"	9	1,030	9	150
19	White Cap Yellow Dent	78	"	Sept. 3	Silking	8	1,820	7	1,400
20	Cloud's Early Yellow	80	Medium	" 10	"	8	1,600	10	460
21	Pride of the North	75	"	" 3	"	8	1,600	7	850

INDIAN CORN SOWN AT DIFFERENT DISTANCES APART.

Experiments were again carried on this year with Indian corn planted at different distances apart, three varieties being used. The treatment of the soil as to cultivation, fertilization, &c., given under 'Experiments with Indian Corn,' apply to this test also. Each plot was 2 drills, 66 feet long.

The following were the results obtained:—

Name of Variety.	Distance Apart.	Yield per Acre.	
	Inches.	Tons.	lbs.
Selected Leaming	42	11	795
Longfellow	42	11	325
Champion White Pearl	42	8	1,790
Selected Leaming	35	12	200
Longfellow	35	9	425
Champion White Pearl	35	10	515
Selected Leaming	28	11	10
Longfellow	28	9	1,667
Champion White Pearl	28	11	1,100
Selected Leaming	21	13	1,075
Longfellow	21	11	325
Champion White Pearl	21	10	1,850

FIELD CROP OF INDIAN CORN.

One and one-quarter acres of Indian corn were grown in field crop. The land was a clay loam in a good state of fertility, the previous crop having been clover hay. This land was manured on the sod in the fall and early winter of 1907 with barn-yard manure at the rate of 20 tons per acre, ploughed in June, 1908, and sown June 14. The variety of Indian corn used for seed was Longfellow. The cold, wet season was very unsuitable for this crop, which yielded at the rate of 10½ tons per acre.

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown two weeks apart in duplicate plots, on a sandy loam, the previous crop having been hay. The ground was ploughed in the fall of 1907 and cultivated in the spring of 1908 with the spade and spring-tooth harrows. Barn-yard manure was then spread on with the manure spreader at the rate of about 20 tons per acre, ploughed under and thoroughly cultivated. Complete fertilizer (Bowker's Square brand) at the rate of 500 lbs. per acre was sown broadcast, and harrowed in with the smoothing harrow. Rows were made 24 inches apart, and the plants subsequently thinned out to one foot apart in the rows.

The yield was calculated from the weight gathered from two rows each 66 feet long. The first set of plots were sown June 1, and second set on June 15 and all were pulled November 9.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Good Luck	34	1,465	1,157	45	26	140	869	..
2	Hall's Westbury	32	1,175	1,086	15	21	735	712	15
3	Kangaroo	31	1,855	1,064	15	22	1,705	761	45
4	Carter's Elephant	31	1,525	1,058	45	19	1,600	660	..
5	Jumbo	30	225	1,003	45	21	900	715	.
6	Halewood's Bronze Top	30	60	1,001	..	23	695	778	15
7	Perfection Swede	29	575	976	15	21	405	706	45
8	Magnum Bonum	29	80	968	..	25	1,315	855	15
9	Hartley's Bronze	28	265	937	45	23	200	770	..
10	Skirvings	28	100	935	..	20	260	671	..
11	Mammoth Clyde	26	1,295	888	15	22	55	734	15
12	Bangholm Selected	26	635	877	15	19	445	640	46

FIELD CROP OF TURNIPS.

Five acres of turnips were sown in lots of one acre each. The land was a clay loam in rather a poor state of fertility, the previous crop having been clover hay, and being in a five-year rotation had not received any manure since 1903. The land was ploughed in the fall of 1907, and cultivated in the spring of 1908 with the spade and spring-tooth harrows. Barn-yard manure at the rate of about 20 tons per acre was ploughed under and thoroughly cultivated, after which it was run up in rows 24 inches apart. Each acre was divided into three equal parts, to one-third of each was added Bowker's Square brand complete fertilizer at the rate of 500 lbs. per acre, to another third was added the same complete fertilizer at the rate of 250 lbs. per acre, and the remaining third of each acre had manure only. They were sown on June 17, 19, 20, 21 and 22, and pulled from November 1 to November 8.

FIELD CROPS OF TURNIPS.

Name of Variety, Size of Plot and date Pulled.		Yield per Acre.		Yield per Acre.	
Purple Top Swede (Pulled November 1).		Tons.	Lbs.	Bush.	Lbs.
$\frac{1}{3}$ acre—manure, 20 tons complete* fertilizer, 500 lbs. per acre		27	1,400	923	20
$\frac{1}{3}$ " " 20 " fertilizer, 250 lbs. per acre		26	1,475	891	15
$\frac{1}{3}$ " " 20 " only		22	1,540	759	..
Cost per acre of 500 lbs. complete fertilizer at $30 per ton	$7 50				
Value per acre in crop over manure only, 164$\frac{1}{3}$ bush. at 6c. per bush	9 86				
Gain per acre	$2 36				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton	3 75				
Value per acre in crop over manure only, 132$\frac{1}{4}$ bush. at 6c. per bush	7 93$\frac{1}{2}$				
Gain per acre	$4 18$\frac{1}{2}$				
Magnum Bonum (Pulled November 4).					
$\frac{1}{3}$ acre—manure, 20 tons complete fertilizer, 500 lbs. per acre		27	1,965	932	45
$\frac{1}{3}$ " " 20 " 250 "		25	1,420	857	..
$\frac{1}{3}$ " " 20 " only		25	55	834	15
Cost per acre of 500 lbs. complete fertilizer at $30 per ton	$7 50				
Value per acre in crop over manure only, 98$\frac{1}{2}$ bush. at 6c. per bush	5 91				
Loss per acre	$1 59				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton	3 75				
Value per acre in crop over manure only, 22$\frac{3}{4}$ bush. at 6c. per bush	1 36$\frac{1}{2}$				
Loss per acre	$2 38$\frac{1}{2}$				
Hartley's Bronze (Pulled November 5).					
$\frac{1}{3}$ acre—manure, 20 tons complete fertilizer, 500 lbs. per acre		24	1,305	821	45
$\frac{1}{3}$ " " 20 " " 250 "		24	615	810	15
$\frac{1}{3}$ " " 20 " only		23	1,430	790	30
Cost per acre of 500 lbs. complete fertilizer at $30 per ton	$7 50				
Value per acre in crop over manure only, 31$\frac{1}{4}$ bush. at 6c. per bush	1 87$\frac{1}{2}$				
Loss per acre	$5 62$\frac{1}{2}$				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton	3 75				
Value per acre in crop over manure only, 19$\frac{3}{4}$ bush. at 6c. per bush	1 18$\frac{1}{2}$				
Loss per acre	$2 56$\frac{1}{2}$				
Kangaroo (Pulled November 6).					
$\frac{1}{3}$ acre—manure, 20 tons complete fertilizer, 500 lbs. per acre		26	1,790	896	30
$\frac{1}{3}$ " " 20 " " 250 "		24	1,245	820	45
$\frac{1}{3}$ " " 20 " only		24	525	808	45
Cost per acre of 500 lbs. complete fertilizer at $30 per ton	$7 50				
Value per acre in crop over manure only, 87$\frac{3}{4}$ bush. at 6c. per bush	5 26$\frac{1}{2}$				
Loss per acre	$2 23$\frac{1}{2}$				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton	3 75				
Value per acre in crop over manure only, 12 bush. at 6c. per bush	0 72				
Loss per acre	$3 03				

FIELD CROPS OF TURNIPS—*Continued.*

Name of Variety, Size of Plot and date Pulled.		Yield per Acre.		Yield per Acre.	
Mixed Varieties (Pulled November 8).		Tons	Lbs.	Bush.	Lbs.
⅓ acre—manure, 20 tons complete fertilizer, 500 lbs. per acre		26	1,565	892	45
⅓ " " 20 " " 250 "		26	515	875	15
⅓ " " 20 " only		25	895	848	15
Cost per acre of 500 lbs. complete fertilizer at $30 per ton	$7 50				
Value per acre in crop over manure only, 44½ bush. at 6c. per bush	2 67				
Loss per acre	$4 83				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton	3 75				
Value per acre in crop over manure only, 27 bush. at 6c. per bush	1 62				
Loss per acre	$2 13				

* Bowker's Square Brand was the complete fertilizer used in all these tests.

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were sown in duplicate plots two weeks apart. The land was a clay loam, the previous crop having been clover hay. It was ploughed early in the fall of 1906, and cultivated well in the spring following. After which barnyard manure at the rate of 20 tons per acre was spread on and ploughed under.

Bowker's complete fertilizer, square brand, at the rate of 500 lbs. per acre was sown broadcast and harrowed in with the smoothing harrow. The rows were made 24 inches apart, raked down and the seed sown with the Planet Jr. hand seed drill, in bunches 12 inches apart in the row, and from 4 to 8 seeds in each bunch. When from 3 to 4 inches high they were thinned out, leaving one plant in each spot. The first series of plots was sown June 1 and the second on June 15. All were pulled October 26.

The yield was obtained from the weight gathered from two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Intermediate	38	1,385	1,289	45	24	445	807	25
2	Yellow Intermediate	36	1,425	1,223	45	23	1,190	786	30
3	Gate Post	36	600	1,210	..	28	100	935	..
4	Prize Mammoth Long Red	32	1,175	1,086	15	21	900	715	..
5	Half Sugar White	31	1,525	1,058	45	25	430	840	30
6	Selected Yellow Globe	28	925	948	45	23	1,025	783	45
7	Giant Yellow Globe	27	450	907	30	23	200	770	..
8	Mammoth Red Intermediate	26	1,295	888	15	18	1,125	618	45
9	Crimson Champion	26	800	880	..	18	465	607	45
10	Perfection Mammoth Long Red	25	1,480	858	..	22	385	739	45

FIELD CROP OF MANGELS.

Two acres of mangels were sown in four plots of one-half acre each. Three varieties were used, Mammoth Long Red, Yellow Intermediate and Yellow Globe. The land on which this crop was grown, varied in character from a clay loam to a sandy loam, rather the larger half being sandy loam. This land was in hay the previous season, was ploughed in the fall of 1907 and cultivated in the spring 1908 with the spade and spring-tooth harrows. Barn-yard manure was spread on with the manure spreader at the rate of about 20 tons per acre, ploughed under, and well worked up. To one-third of each half acre was added complete fertilizer* at the rate of 500 lbs. per acre, to another third was added complete fertilizer at the rate of 250 lbs. per acre, and the remaining third of each acre had manure only.

The mangels were sown on June 12 and 13 and pulled on October 28.

FIELD CROPS OF MANGELS.

Name of Variety, how Fertilized and Size of Plot.		Yield per Acre.		Yield per Acre.	
Mammoth Long Red—(Pulled Oct. 28).		Tons.	Lbs.	Bush.	Lbs.
⅓ Acre—manure, 20 tons complete fertilizer, 500 lbs. per acre		11	1,100	385	..
⅓ " " 20 " " 250 "		10	700	345	..
⅓ " " 20 " only		11	680	378	..
Cost per acre of 500 lbs. complete fertilizer at $30 per ton..$	7 50				
Value per acre in crop over manure only, 7 bush. at 6 cts. per bush	42				
Loss per acre $	7 08				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton..	3 75				
Value per acre in crop, less than manure only, 33 bush. at 6 cts. per bush	1 80				
Loss per acre $	5 55				
Yellow Intermediate—(Pulled Oct. 28).					
⅓ Acre—manure, 20 tons complete fertilizer 500 lbs. per acre		12	1,770	429	30
⅓ " " 20 " " 250 "		10	1,240	354	..
⅓ " " 20 " only		10	340	339	..
Cost per acre of 500 lbs. complete fertilizer at $30 per ton..$	7 50				
Value per acre in crop over manure only, 90½ bush. at 6 cts. per bush	5 40				
Loss per acre $	2 10				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton..	3 75				
Value per acre in crop over manure only, 15 bush. at 6 cts. per bush	90				
Loss per acre $	2 85				
Yellow Globe—(Pulled Oct. 28).					
⅓ Acre—manure, 20 tons, fertilizer, 500 lbs. per acre		10	620	343	40
⅓ " " 20 " " 250 "		8	1,400	290	..
⅓ " " 20 " only		8	1,110	285	..
Cost per acre of 500 lbs. complete fertilizer at $30 per ton..$	7 50				
Value per acre in crop over manure only, 58⅔ bush. at 6 cts. per bush	3 52				
Loss per acre $	3 98				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton..	3 75				
Value per acre in crop over manure only, 5 bush. at 6 cts. per bush	30				
Loss per acre $	3 35				

FIELD CROPS OF MANGELS—*Continued.*

Name of Variety, how Fertilized and Size of Plot.	Yield per Acre.		Yield per Acre.	
Yellow Intermediate—(Pulled Oct. 28).	Tons.	Lbs.	Bush.	Lbs.
⅓ Acre—manure, 20 tons complete fertilizer, 500 lbs. per acre....	11	1,010	383	30
⅓ " " 20 " " 250 "	10	1,150	352	30
⅓ " " 20 " only........	8	1,250	287	30
Cost per acre of 500 lbs. complete fertilizer at $30 per ton..$ 7 50				
Value per acre in crop over manure only, 96 bush. at 6 cts. per bush... 5 76				
Loss per acre......................... ....$ 1 74				
Cost per acre of 250 lbs. complete fertilizer at $30 per ton.. 3 75				
Value per acre in crop over manure only, 65 bush. at 6 cts. per bush........... .. . . 3 90				
Gain per acre............. .. ..$ 15				

EXPERIMENTS WITH CARROTS.

Six varieties were sown in uniform test plots. Two sowings were made of each sort, two weeks apart, the first on June 1, and the second on June 15, in rows 24 inches apart, and thinned to about 3 inches apart in the rows. The land was a clay loam, inclined to be somewhat sandy, having been in hay the previous year. It was ploughed early in the fall of 1907 and cultivated thoroughly in the spring, of 1908. Manure was spread on the land at the rate of 20 tons per acre and ploughed in and then worked well up and Bowker's Square brand complete fertilizer at the rate of 500 lbs. per acre added. The first sowing was almost entirely a blank. Very few of the plants coming up, owing probably to the cold, wet weather.

The crop was pulled October 26, and the yield obtained from the second sowing on June 15, was as follows:—

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. — 2nd Plot.			
		Tons.	lbs.	Bush.	lbs.
1	Ontario Champion	17	815	580	15
2	Improved Short White	16	835	547	15
3	Half Long Chantenay	16	505	541	45
4	Giant White Vosges	15	30	500	30
5	Mammoth White Intermediate	14	1,700	495	..
6	White Belgian	14	50	467	30

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were sown in duplicate lots, two weeks apart, the first on June 1, and the second on June 15. The land was similar to that on which the mangels were sown, and received the same treatment. The seed was sown in rows 24 inches apart. When the plants were about 3 to 4 inches high, the bunches were

thinned out to one plant in each place. The crop was harvested on October 26, and the yield calculated from the weight obtained from two rows, each 66 feet long.

The following are the results:—

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
1	Wanzleben	15	195	503	15	14	710	478	30
2	Vilmorin's Improved	13	730	415	30	12	1,245	420	45
3	French Very Rich	12	1,575	426	15	13	400	440	..

EXPERIMENTS WITH POTATOES.

Twenty-eight varieties were included in this test. The land was clay loam with some sand. No crop was grown on this land the previous season, it having been summer-fallowed with a view to destroying couch grass. Barn-yard manure at the rate of about 20 tons per acre was spread on late in the summer of 1906. In the spring of 1907 this was well worked up with the spade and spring-tooth harrows, ploughed and again worked up. The rows were run 30 inches apart and complete fertilizer at the rate of 400 lbs. per acre was spread in the rows before planting, and the sets which had at least three good eyes were dropped one foot apart in drills. Two rows, 66 feet long each, were planted making 132 sets in each variety and covered with the drill plough. The drills were harrowed down before the plants came up and again rowed up, and again harrowed down just before the plants came through the ground. The plants were sprayed with Bordeaux mixture and Paris green three times, but on account of the continued wet weather this could not be done as thoroughly as desired. It so happened that those plots were on the brow of a hill where there was no possibility of any water lying, which may have helped to save this crop from rot, potatoes generally having rotted badly in this section.

There was no blight, scab or rot. The potatoes were planted June 3 and dug October 9.

The following table shows the yields obtained:—

Potatoes—Test of Varieties.

Number.	Name of Variety.	Quality.	Yield per Acre. Total.		Yield per Acre. Marketable.		Yield per Acre. Unmarketable.		Form and Colour.
			Bush.	lbs.	Bush.	lbs.	Bush.	lbs.	
1	Rochester Rose	Fair	576	24	521	24	55	..	Oblong. Dark pink.
2	Everett	"	561	..	495	..	66	..	Flat, round. White.
3	Vermont Gold Coin	Good	543	24	484	..	59	24	" " "
4	Vick's Extra Early	"	532	24	481	48	50	36	Long. Pink and white.
5	Holborn Abundance	Medium	490	36	418	..	72	36	Round. White.
6	Late Puritan	Good	484	..	429	..	55	..	Long. "
7	Canadian Beauty,	"	479	36	422	24	57	12	" "
8	Dooley	"	473	..	429	..	44	..	Round. "
9	Burnaby Mammoth	"	455	24	400	24	55	..	Oblong. Pink and white.
10	Early White Prize	"	433	24	396	..	37	24	Long. White.
11	Morgan Seedling	"	433	24	374	..	59	24	" Pink and white.
12	Empire State	"	418	..	380	36	37	24	Long and round. White.
13	Ashleaf Kidney	"	409	12	367	24	41	48	Round. White.
14	Money Maker	"	407	..	336	36	70	24	Long. "
15	American Wonder	"	396	..	358	36	37	24	Long and round. White.
16	Maule's Thoroughbred	Medium	396	..	352	..	44	..	Oblong. Pink.
17	Carman No. 1	Very good	387	12	336	36	50	36	Round. White.
18	Reeve's Rose	"	374	..	308	..	66	..	Oblong. Pink.
19	Country Gentleman	Fair	367	24	327	48	39	36	Round. Pink and white.
20	Sabean's Elephant	"	363	..	323	24	39	36	Oblong.
21	Early Rose	Good	358	36	312	24	46	12	Long. Pink.
22	Dreer's Standard	"	349	48	292	36	57	12	Round. White.
23	Early Envoy	"	341	..	297	..	44	..	Oblong. Pink.
24	Dalmeny Beauty	"	334	12	286	..	46	12	Round. White.
25	State of Maine	"	323	24	279	24	44	..	Round. White.
26	Bovee	"	303	36	231	..	72	36	Oblong. Pink and white.
27	Irish Cobbler	Very good	301	24	264	..	37	24	Round. White.
28	Uncle Sam	"	299	12	259	36	39	36	Round. White.

EXPERIMENTS WITH MILLET.

Five varieties of millet were grown in plots of one-fortieth of an acre each. The land was a heavy clay loam in a fairly good state of fertility having had a dressing of manure two years previous. The land was ploughed in the fall, well worked up in the spring, and the seed sown June 24 by the Planet Jr. hand-seed drill. It was cut on October 3, after having been somewhat frozen, and weighed green.

The following are the yields obtained:—

No.	Variety.	Yield per Acre.	
		Tons.	Lbs.
1	African Early	5	1,380
2	Pearl or Cat-tail	4	20
3	Italian or Indian	3	1,880
4	Moha Hungarian	2	1,400
5	White Round French	2	1,080

EXPERIMENTS WITH INOCULATED CLOVER AND ALFALFA.

Experiments were carried on with alfalfa and clover each treated and untreated with nitro culture, to determine 1st, the comparative value of Alfalfa clover grown in this section, and also the benefit derived from nitro culture as compared with untreated seed. Four half acre plots were used for this experiment, on land in a rather poor state of fertility. Careful notes were taken from time to time, but no perceptible difference was found in the plots treated or untreated in either case, Moderately good growth was made in all cases, but at present date of writing, March 15, very little, if any, of alfalfa either treated or untreated seems to be alive. This experiment was duplicated, in a smaller way on plots of one-fortieth acre each, on land in a good state of fertility, with the same results as far as any advantage could be seen from the addition of nitro culture. The growth of both clover and alfalfa treated and untreated being particularly good and at date of writing March 15 would appear as if it had stood the winter fairly well.

SPECIAL EXPERIMENTS WITH FERTILIZERS.

Experiments having been carried on for 5 years previous to 1904, without any change of fertilizer per plot for the entire period, it was decided to discontinue the use of fertilizers with a view to determine to what extent the fertilizers already applied would continue to supply plant food for the crop. The field was seeded to grain, two series of plots each, oats, barley, wheat, peas and mixed grain. Each series running across the various plots where different fertilizers had been used. With each kind of grain was sown Mammoth Red clover at the rate of 10 lbs. per acre, on the other series of plots the grains were sown alone without clover. This was the fourth crop since receiving any fertilizer. The ground was ploughed in the spring and cultivated thoroughly. The plots were one-eighth of an acre each. The following yields were obtained from these plots:—

SPECIAL EXPERIMENTS WITH FERTILIZERS.

Number.	Fertilizers used each Year, per Acre, previous to 1904.	Waverley Oats, with Clover.		Waverley Oats, without Clover.		Stanley Wheat, with Clover.		Stanley Wheat, without Clover.		Logan Barley, with Clover.		Logan Barley, without Clover.		Mixed Grain, with Clover.		Mixed Grain, without Clover.	
	Sown June 21, Cut Sept. 28.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.	Bush.	Lbs.
1	Manure, rotted, 30 tons	51	16	64	24	25	40	23	20	47	44	43	36	45	..	48	30
2	Manure, rotted, 15 tons. Fertilizer, 250 lbs.	61	26	58	28	30	..	25	50	46	42	41	32	55	..	47	20
3	Complete fertilizer, 1,000 lbs. Bowkers Square Brand	50	..	48	18	21	40	20	..	43	36	33	16	50	..	46	10
4	" " "	47	2	45	20	20	50	18	20	39	28	35	26	53	20	43	30
5	Check, no fertilizer used	45	20	41	6	23	30	17	30	36	32	34	18	41	10	39	15
6	Bone meal, 1,000 lbs.	47	2	50	..	21	40	16	40	35	20	30	10	42	20	43	30
7	" 500 "	42	22	44	4	24	10	15	..	34	18	32	14	40	.	41	10
8	Ashes, 2,500 lbs	47	27	39	24	23	20	19	10	37	24	31	12	38	30	40	..
9	Manure, rotted, 20 tons	47	2	47	2	25	..	22	30	40	30	35	45	43	30	42	20
10	Check. No fertilizer used	38	8	38	8	18	20	14	10	22	44	20	40	35	..	36	10
11	Land plaster, 500 lbs	35	10	33	28	16	40	15	..	28	6	29	8	37	20	35	..
12	Salt, 500 lbs	45	20	44	29	20	..	18	20	37	24	34	18	42	20	45	.
13	Marsh mud, 100 tons	46	11	44	4	25	50	20	..	44	38	36	22	45	25	41	35
14	Manure, green, 20 tons	52	32	44	9	30	50	25	..	52	4	38	26	51	10	46	35

HAY CROP.

The hay crop was considerably below the average, having suffered more than usual from winter killing, especially on newly sown oat fields.

The clover and timothy was fairly good on some parts, while on others they were only moderately good, the total yield on 26 acres of upland being 50 tons, 660 lbs.

The hay on the marsh until after July 1 was extremely light. After this date a marked improvement was made, 45 acres yielding 44 tons, 750 lbs., making the total hay crop 94 tons, 1,410 lbs.

SUMMARY OF CROPS GROWN, EXCLUSIVE OF UNIFORM TEST PLOTS OF GRAIN AND POTATOES.

Hay.

	Tons.	Lbs.
Marsh hay	50	660
Upland hay	44	750
	94	1,410

Grain.

	Bush.	Lbs.	Lbs.
Mixed grain	531	7	21,247
Oats	390	10	13,260
Barley	48	31	2,335
Wheat	9	24	564
Buckwheat	25	..	1,200
			38,606

Roots.

	Bush.	Lbs.	Tons.	Lbs.
Turnips (field crop)	4,219	48	126	1,188
Turnips (test plots)	120	47	3	1,247
	4,340	35	130	435
Mangels (field crop)	745	27	22	727
Mangels (test plots)	109	25	3	565
	854	52	25	1,292

Corn.

	Tons.	Lbs.
Corn (field crop)	13	420
Corn (test plots)	6	236
	19	656

GRAIN AND POTATO DISTRIBUTION.

Some of the most promising varieties of grain and potatoes were again distributed for test to farmers who made application. The following number of 3 lb. bags were sent out.

Oats	190
Barley	74
Wheat	78
Pease	36
Buckwheat	20
Potatoes	275
Total	673

HORSES.

There are at present eight horses on the farm, 3 teams of draft horses, one express horse and one driver. During the year two of the older horses were exchanged for a younger pair, leaving the total number as before. All are in good condition.

CATTLE.

The stock at present consists of 68 grade Shorthorn steers and 1 pure-bred Holstein cow.

The steers were purchased the latter end of October, delivered and put in to feed November 16, during which time they had been fed outside on hay only. Roots were then fed, increasing from time to time, until at the end of one month they were being fed 40 lbs. of roots per day per steer. From this time on the amount of roots was decreased 10 lbs. every 4 weeks. For the first 2 weeks no meal was fed. After this commencing December 1, 1 lb. meal per day per steer was fed for 2 weeks, following this 2 lbs. meal per day for the next 4 weeks, increasing 1 lb. per day per steer each four subsequent weeks, until at present, March 15, they are being fed 5 lbs. meal per day per steer, and 10 lbs. roots and what hay is eaten up cleanly, about 15 lbs.

	Lbs.
Total live weight of 68 steers, November 16, 1907	67,875
Total live weight of 68 steers, March 15, 1908	78,355
Increase	10,480
Average daily gain per steer	1·28

STEER FEEDING EXPERIMENT OF 1906.

At the time of making my report for 1906, fifty steers were reported as being on hand, being fattened for sale later, a report of which was made up to March 15, 1907. The following is a report of the completion of the experiment with steers for 1906:—

Experiment of Steers, 1906, unfinished in last report, completed.

	Lbs.
Total live weight of 50 steers, December 15, 1906	48,715
Total live weight of 50 steers, March 15, 1907	57,285
Increase to March 15, 1907	8,570
Total live weight of 50 steers, May 30, 1907	63,620
Increase to May 30, 1907 (Total)	14,905

Financial Results.

Original weight of 50 steers, 48,715 lbs., at $4\frac{49}{100}$c. per lb.	$2,188 37
Weight at finish of 50 steers, 63,620 lbs., at $5\frac{55}{100}$ per lb.	3,530 91
Balance	$1,342 54
Cost of feed for lot, 165 days	1,167 37
Net profit	$175 17

Daily rate of gain per steer, 1·80 lbs.
Cost of 1 lb. gain, 7·83 cents.
Cost of feed per day per steer, 14·15 cents.
Profit per steer, $3.50.

SWINE.

The herd at present on the farm consists of:—

1 pure-bred Yorkshire boar.
4 pure-bred Yorkshire sows.
7 young pigs.

SHEEP.

The flock of sheep at present consists of 23 head, as follows:—

6 pure-bred Leicester ewes.
9 pure-bred Shropshire ewes.
2 Shropshire ram lambs.
6 grade ewes.

POULTRY.

The stock of poultry on hand at present consists of B. P. Rocks, W. Wyandottes, W. Leghorns, Blk. Minorcas and Buff Orpingtons.

The pens are made up as follows:—

	Cocks.	Hens.
B. P. Rocks	1	10
W. Wyandottes	1	4
W. Leghorns	1	8
Blk. Minorcas	1	3
Buff Orpingtons	1	4

The number of eggs laid by the different breeds during the year is as follows:—

Breed.	Eggs.	Average.
8 B. P. Rocks	784	98
5 W. Wyandottes	350	70
5 W. Leghorns	400	80
3 Blk. Minorcas	260	86
4 Buff Orpingtons	260	65

BEES.

On April 25 the bees were all taken out of their winter quarters and put on their summer stands at 6 a.m. The day was bright but cool with a brisk northeast wind blowing, but the bees came out and had a good fly, showing the colonies to be in a strong state, a few got chilled but the noon sun rallied them all. One colony deserted during the winter into another hive, making 8 colonies spring count. The weights of the different colonies were as follows:—

	Nov. 18, 1906.	Apl. 25, 1907.	Loss.
1	63 lbs.	48 lbs.	15 lbs.
2	50 "	42 "	8 "
3	59 "	49 "	10 "
4	50 "	42 "	8 "
5	50 "	37 "	13 "
6	58 "	46 "	12 "
7	64 "	50 "	14 "
8	66 "	52 "	14 "
	460 "	366 "	94 "

Average loss, 11¾ lbs.

Some covering, such as bran sacks, were kept on the hives at night until warm weather set in, as a precaution against chilling brood.

April 29.—All hives gathering pollen from willows.

May 7.—On examining hives, on a fine calm afternoon, brood was found in all hives.

In No. 1, into which No. 9 had emigrated during the winter 6 frames were found well filled with brood. All hives were examined once a week, when suitable weather offered, and state of same noted. Frames of brood from stronger hives, were put in weaker hives, and frames of honey substituted. This was done until June 1st, when the bees were found to be gathering enough honey for brood rearing.

June 1.—Noticed first drones. Bees working on dandelion.

June 5.—Failed to find queen in No. 3. Gave two frames of brood from No. 1, which had queen cells started, to No. 3 requeening quite successfully by this method. throwing off a swarm, just six weeks after inserting frames of brood.

Some colonies had stored some fruit bloom honey.

June 12.—No. 1 threw off a swarm. This colony had been retarded somewhat on June 5th by the removal of two frames of brood to supplement other hives.

Although the super had only been put on on June 7, it was nearly full at this date, showing very plainly the value of having strong colonies at putting out time, as the other moderately strong hives had not gathered any surplus other than was necessary for young brood.

The past season has been a peculiar one for bee-keepers here, and by no means an ideal one. Bees came through the winter in good condition and did well through fruit-blooming time and were very strong at commencement of the clover season, giving great promise for a good crop of honey. In this, however, we were disappointed, as from June 15 right through the season, the weather was unusually cold and wet with very little sunshine, with the result that no clover honey was gathered. What little honey was gathered was golden rod, gathered late in the season, and of poor quality both as to colour and flavour.

The largest days gathering by any single colony was 3½ lbs. There was very little honey gathered during August and September, both months having had very few days of sunshine. The bees were put in their winter quarters in the cellar of the Superintendent's house on November 19. After having settled in a cluster, each cover and propolis quilt was removed and the hives were covered with bags (3 bags to each hive) and a 3-inch block placed in front between the bottom board and brood chamber, making the entrance 3 inches high across the full front.

APPLES.

The season of 1906 was unfavourable for the fruit trees. There was a series of extremes of cold and heat throughout the winter, and the crop of fruit was not nearly equal to that of the previous season, and on account of the lack of sunshine, very few, if any, varieties ripened properly. The trees, however, made fairly good growth and are now generally in good healthy condition.

STRAWBERRIES.

Twenty-three varieties of strawberries were grown in plots 16½ x 5 feet, and a record kept of yield of same. Besides these, smaller plots, one-fourth this size, were grown of which no record was kept this season, from which varieties plots were set out for another season. Unfortunately this land was in a poorer state of fertility than is desirable for this crop. The twenty-three varieties were set out quite late in the season of 1906 these plants had made very fair growth up to the setting in of the winter. After the ground was frozen, a mulch of straw about 2 inches deep was spread on and removed in the spring. Most of the plants came through the winter

in good condition and made fairly good growth through the summer. The yield was as follows:—

STRAWBERRIES.

Variety.	Dates when picked and Yield.			Yield per Plot.	Yield per Acre.
	July 15.	July 17.	July 23.		
	Qts.	Qts.	Qts.	Qts.	Qts.
Pearl	16	11	8	35	18,480
Clyde	16	10	9	35	18,480
H. W. Beecher	14	13	6	33	17,424
Lovett	12	11	7	30	15,810
Capt. Jack	11	9	6	26	13,728
G. H. Conghill	11	8	6	25	13,200
Bisel	15	6	4	25	13,200
Glen Mary	8	7	6	21	11,088
Warfield	9	6	2	17	8,976
Ida	7	5	3	15	7,920
Beder Wood	5	5	3½	13½	7,128
Brandywine	6	4	3	13	6,864
Big Bob	6	4	2	12	6,336
Princess	6	3	1½	10½	5,544
Enhance	5	3	2	10	5,280
Afton	6	2	2	10	5,280
Senater Dunlap	4	2	2	8	4,224
John Little	4	3	..	7	3.696
Gandy	3	2	1	6	3,168
Equinox	3	1	1	5	2,640
Parker Earle	2	1	1	4	2,112
Howard No. 4	1	1	1	3	1,584
Paris King	1	1	..	2	1,056

GARDEN PEAS.

Ten varieties of garden peas were grown in plots each 33 feet long by 2½ feet wide. The seed was sown in rows 2½ feet apart, and the peas were planted 2 inches deep and 2 inches apart in the rows. The peas were picked when fit for market and the quantity of green peas in pods recorded.

The yields were as follows:—

Variety.	Date of Picking and Yields.				Total Yield from Plots.	
	August 3.		August 10.			
	Lbs.	Ozs.	Lbs.	Ozs.	Lbs.	Ozs.
Gradus	12	8	2	6	14	14
Thomas Laxton	11	..	4	8	15	8
New Surprise	9	..	3	6	12	6
American Wonder	10	8	6	..	16	8
Prosperity	8	8	5	8	14	..
Sutton's Excelsior	7	..	3	8	10	8
Champion	7	6	1	8	8	14
Electric Light	6	4	2	4	8	8
Claudit	6	4	4	..	10	4
Magnum Bonum	7	2	4	4	11	6

GARDEN BEANS.

Seven varieties of beans were planted in rows 36 feet long. The seed was sown on June 11, and dropped 2 inches apart in the rows. A duplicate plot of each variety was planted and allowed to ripen.

Owing to the extremely wet season, the beans ripened very unevenly and were much rusted, consequently no record was kept of the ripened seed.

The following yields of green beans were gathered when fit for market:—

Variety.	Date of Picking and Yields.						Total Yield from Plot.	
	August 6.		August 14.		August 22.			
	Lbs.	ozs.	Lbs.	ozs.	Lbs.	ozs.	Lbs.	ozs.
Dwarf Extra Early	10	4	3	2	2	4	15	10
Emperor of Russia	12	8	4	0	3	8	20	0
Matchless	10	0	2	0	2	0	14	0
Fame of Vitry	13	4	4	0	1	0	18	4
Golden Skinless	12	12	4	8	3	0	20	4
Dwarf Wax	10	4	2	0	2	0	14	4
Dwarf Black Speckled	11	6	3	2	1	8	16	0

TOMATOES.

Eighteen varieties of tomatoes were grown last season. The seed was sown in hot beds on April 9, the plants pricked out into strawberry boxes on April 29, and kept in a cold frame until June 6, when 10 plants of each variety were planted in the field, 4 feet apart each way.

The yields were as follows:—

Number.	Variety.	Ripe Fruit.	Green Fruit.	Yield per Plot.
		Lbs.	Lbs.	Lbs.
1	Ponderosa	67½	222½	290
2	First of All	56¼	220	276¼
3	Earlibelle	72½	200	272½
4	June Pink	72½	200	272½
5	Chalk's Early Jewel	53¾	210	263¾
6	Earliana	61¼	195	256¼
7	Perfection	47½	197½	245
8	Golden Queen	75	167½	242½
9	Atlantic Prize	65	175	240
10	Beefsteak	60	170	230
11	Matchless	55	157½	212½
12	Plentiful	48¾	160	208¾
13	Early Hustler	50	125	175
14	Mikado	37½	135	172½
15	Dwarf Champion	62½	100	162½
16	Hustler	40	122½	162½
17	Success	37½	115	152½
18	Imperial	36¼	100	136¼

LIST OF THE BEST VEGETABLES TO GROW.

Repeated from Report of 1906.

From several years' experience in testing many of the different varieties of vegetables now advertised by seed merchants in Canada and the United States, the following may be recommended as equal to any of those so far tested here:—

Asparagus.—Conover's Colossal and Argenteuil.

Beans.—Early: Matchless, Medium, Emperor of Russia. Late: Golden Skinless.

Beets.—Extra Early: Egyptian Turnip. Early: Eclipse.

Brussels Sprouts.—Improved Dwarf.

Cabbage.—Early: Jersey Wakefield, Paris Market. Medium: Early Spring and Succession. Late: Late Flat Dutch.

Carrots.—Early: Chantenay.

Cauliflower.—Early: Erfurt.

Celery.—Paris Golden Yellow Self-blanching, Improved White Plume.

Corn.—Extra Early: Extra Early Beverly. Early: Extra Early Cory.

Cucumbers.—White Spine.

Egg Plant.—New York Improved Purple.

Kale.—Dwarf Green Curled.

Lettuce.—Curled: Black Seeded Simpson, Cabbage, Improved Salamander.

Citron Melon.—Colorado Mammoth.

Water Melon.—Cole's Early.

Onions.—Prizetaker and Australian Brown.

Parsley.—Double curled.

Parsnips.—Hollow Crown and Improved Half Long.

Peas.—Early: New Surprise, Thomas Laxton. Medium: Prosperity, Gradus. Late: Champion, Prince Edward.

Radishes.—French Breakfast and Icicle.

Rhubarb.—Linnaeus and Victoria.

Salsify.—Sandwich Island.

Spinach.—Victoria.

Squash.—Autumn: Boston Marrow and Golden Hubbard. Late: Hubbard.

Tomatoes.—Sparks' Earliana and June Pink.

Turnips.—Golden Ball and Selected Purple Top Swede.

CORRESPONDENCE.

During the year 2,660 letters were received and 2,625 sent out, exclusive of reports and of circulars mailed with samples of grain.

AGRICULTURAL MEETINGS.

During the year I attended and delivered addresses at the following meetings:—

Tidnish, Cumb. Co., N.S., Aug. 5, 1907; Northport, Cumb. Co., N.S., Aug. 6, 1907; Linden, Cumb. Co., N.S., Aug. 7, 1907; Moncton West. Co., N.B., Aug. 8, 1907; Board of Trade, St. John, N.B., Aug. 20, 1907; Maritime Winter Fair, Amherst, N.S., Dec. 2 to 5, 1907; N. S. Fruit Growers, Berwick, N.S., Dec. 18 to 20, 1907; Short Course Judging, Truro, N.S., Jan. 2 to 11, 1908; N. B. F. and D. Association, Fredericton, N.B., Jan. 22 to 23, 1908; N. S. F. and D. Association, Antigonish, N.S., Jan. 29 and 30, 1908; Live Stock Convention, Ottawa, Ont., Feb. 5 to 10, 1908.

EXHIBITIONS.

An exhibit of farm products was made at the N. B. Provincial Exhibition at Fredericton, and also at the N. S. Provincial Exhibition, Halifax. Besides this I also attended the Prince Edward Island Exhibition at Charlottetown, the Antigonish County, N.S., Exhibition, and the Stewiacke Agricultural Society's Exhibition.

VISITORS.

During the year a large number of farmers and others visited the farm, the larger gatherings being the Pictou County Farmers' Association, and the Cumberland County Farmers' Association.

I have the honour to be, sir,
Your obedient servant,

R. ROBERTSON,
Superintendent.

EXPERIMENTAL FARM FOR MANITOBA.

REPORT OF JAMES MURRAY, B.S.C., SUPERINTENDENT.

BRANDON, March 31, 1908.

Dr. Wm. SAUNDERS, C.M.G.,
Director of Experimental Farms,
Ottawa.

SIR,—I have the honour to present herewith the twentieth annual report of the Experimental Farm for Manitoba at Brandon, Man., giving the results of experiments undertaken during the past year.

The winter of 1906-7 throughout Manitoba and the other prairie provinces was one of the longest and most severe on record, and the spring of 1907 one of the most backward. Winter set in in earnest on the 20th of November, when the temperature fell to 16 degrees below zero, and there was scarcely a break in the severe cold until the following April. During January, February and March, the mercury frequently fell below —30° F., and several times below —40°. These temperatures were in many cases accompanied by high winds and much snow, and in consequence transportation was difficult. As late as the 31st of March the unusual temperature of —8° was recorded and in April the highest recorded was 44·4°. Even during May the weather was unusually cool and backward and spring work was greatly delayed.

The first sowing was done on this farm on May 9, the latest in the history of the farm. In many parts of the province the seeding was even much later than this, and in no district was it more than a few days earlier. The heavy snowfall left the ground well supplied with moisture, and as the weather was favourable after the middle of May, our crops made rapid progress.

Unfortunately this cannot be said of all of Manitoba, as there was a lack of rain in some districts until very late in the season, and when it finally came, the season for growth was so short that the average yield was considerably reduced. The conditions of the growing season varied greatly throughout Manitoba, and while in some parts the yield was reduced on account of drought, in others a heavy crop of excellent quality was harvested. In the north, and to a limited extent in other parts, the crop was injured by August and September frosts. The first frost recorded here was on August 21, when 2·5 degrees was registered; in some parts of Manitoba on the same date 9 degrees was recorded. At this date practically none of the grain in the province was harvested, and much of it being decidedly green was badly injured.

The ripening season was very backward, and no wheat was cut on this farm until August 28—about two weeks later than usual. In spite of the drawbacks of a late cold spring and slow ripening weather, our grain crops gave a good yield. In only a few cases was the sample affected by frost, and even then not enough to injure it seriously.

The weather during threshing was all that could be desired. Open weather continued until well into November, so that in spite of the late harvest, a fair amount of fall ploughing was done.

EXPERIMENTS WITH SPRING WHEAT.

Fifteen varieties of wheat were sown May 9, on one-twentieth of an acre plots at the rate of 1½ bushels per acre on land summer-fallowed the year previous. The

soil was a clay loam. The grain on most of the plots was lodged somewhat owing largely to heavy rains shortly before harvest. There was no smut and very little rust.

Red Fife H, the variety that heads the list this year, is a new strain of Red Fife, produced and selected for earliness and productiveness by the Cerealist of the Experimental Farm at Ottawa, and propagated from a single plant, showing these characteristics.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Red Fife H.	Sept.	9	123	45	Fair.	3½	Bald.	5,160	44	..	59	Slightly.
2	White Fife	"	10	124	47	Stiff.	3½	"	5,340	42	40	59	"
3	Red Fife	"	10	124	49	Fair.	4	"	5,885	41	55	59	"
4	White Russian	"	9	123	47	"	4½	"	6,380	40	20	58	"
5	Riga	"	3	117	46	"	3¼	"	5,520	39	40	59½	"
6	Huron	"	4	118	46	Stiff.	3¼	Bearded.	4,430	39	30	60	"
7	Herisson Bearded	"	8	122	48	Fair.	2½	"	5,750	39	10	61	"
8	Stanley	"	5	119	48	"	3¾	Bald.	6,360	39	..	58	"
9	Bishop	"	2	116	45	"	3	"	5,810	38	10	58	"
10	Preston	"	6	120	46	Stiff.	3¾	Bearded.	4,700	37	20	60	"
11	Pringle's Champlain	"	2	116	44	"	3½	"	4,360	37	20	61	"
12	Hungarian White	"	7	121	45	Fair.	4	"	5,110	36	30	60½	"
13	Percy	"	6	120	50	Stiff.	4	Bald.	6,120	36	20	59½	"
14	Colorado	"	8	122	49	Fair.	4¼	Bearded.	5,820	34	40	60	"
15	Red Fern	"	8	122	50	"	4½	"	5,570	28	50	59½	"

EXPERIMENTS WITH MACARONI WHEAT.

The Macaroni wheats which have again been tried have given good yields and were not as badly lodged as has sometimes been the case. These wheats are of a quality that makes them unsuitable for milling without specially adapted machinery. A very small proportion of them mixed with the ordinary spring wheats materially reduces the market value of such wheats, and their growth cannot therefore be recommended. They appear to be better adapted to districts having less rainfall than we ordinarily have in Manitoba, and in view of their unsuitability to our present conditions, it has been thought best to discontinue most of them from the trial plots on this farm.

The plots were one-twentieth of an acre each and were sown May 9 and 10. The land was clay loam summer-fallowed.

DURUM OR MACARONI WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Roumanian	Sept.	7	120	52	Fair.	2½	Bearded.	4,360	45	40	61	None.
2	Goose	"	12	125	56	"	2½	"	3,240	44	20	62	"
3	Yellow Gharnovka	"	11	124	54	"	2½	"	6,320	39	40	61½	"
4	Mahmoudi	"	8	122	53	"	2½	"	4,060	39	..	60	"

EXPERIMENTS WITH EMMER AND SPELT.

These wheats are unsuitable for milling as the hull adheres to the grain after threshing, but they are grown in some districts for feed. The Common Emmer, commonly, but erroneously, called 'Speltz,' is much the most satisfactory of all that have been under trial here; the average yield of this variety being about 800 pounds per acre higher than any of the others.

The plots were one-twentieth of an acre in extent and were sown on May 10 on clay loam summer-fallowed in 1906.

EMMER AND SPELT—TEST OF VARIETIES.

Number.	Name of Variety,	Date of Ripening.	No. of Days Maturing.	Length of Straw including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	Rusted.
				In.		In.		Lbs.	Lbs.	
1	Common Emmer....	Sept. 14	127	39	Fair. ...	2¼	Bearded..	4,680	2,820	None.
2	Red Spelt..........	" 16	129	44	Stiff....	4½	Bald.	3,060	1,940	"
3	Red Emmer.........	" 13	126	49	"	3	Bearded..	3,870	1,930	"
4	White Spelt.........	" 15	128	43	"	4½	Bald.	3,740	1,720	"

TEST OF LATE SOWING OF SPRING WHEAT.

As it was unusually late before any sowing was done last season, there was much conjecture regarding the latest date at which it was safe to sow wheat. In order to get some information on this in such a season as last year, it was considered advisable to sow several varieties on June 1, and again one week later. The soil was clay loam summer-fallowed. Following are the results:—

Variety.	Sown June 1.		Sown June 8.	
	Yield per Acre.	Weight per Bush.	Yield per Acre.	Weight per Bush.
		Lbs.		Lbs.
Red Fife..	33·30	46	28·10	39
Preston..	25·20	57½	24·20	51
Riga...	35·00	55½	33·00	57

All the grain was somewhat injured by frost as the weight per bushel would indicate. Either of the threshed samples of Red Fife would have graded No. 2 feed, while both of the others would have graded much better. While Riga is a variety several days earlier than Preston, it is not recommended except for very late districts, as it is not so good in quality. The good showing of Preston compared with Red Fife when sown late as these plots were, indicates its suitability for sowing in districts subject to early fall frosts or in seasons where sowing is delayed past the usual date.

FIELD CROPS OF SPRING WHEAT.

Variety.	No. of Acres.	Preparation of Land.	Days Maturing.	Yield per Acre.		Total Yield.	
				Bush.	Lbs.	Bush.	Lbs.
Red Fife	12	Third crop. Fall plowed	116	26	..	312	..
White Fife	4½	Summerfallow	114	36	32	146	24
Percy	2¼	"	112	41	59	84	13
Stanley	5	Pea land. Fall plowed	109	29	56	149	40
Preston	2¼	Summerfallow	108	29	47	67	..
Preston S.	7¾	"	112	24	30	190	..
Pringle's Champlain	5	Third crop. Fall plowed	107	23	..	115	..
Huron	3¾	Summerfallow	108	30	40	115	..
Red Fife	7	Corn land, Spring plowed	114	32	19	226	13
Preston	10	Third crop. Fall plowed	108	22	30	225	..
Total						1,630	30

SMUT PREVENTATIVES.

Smut was not so prevalent last season as in some recent years, but there is every year much of this disease in the wheat that could be prevented by thorough treatment of the seed. From the more recently settled districts particularly, there is frequently much smutty wheat shipped. This would indicate that there is either a lack of knowledge as to how smut can be prevented, or carelessness in practice. The methods of dealing with the disease have frequently been detailed in reports and periodicals, but it would appear advisable to reiterate for the benefit of those who are inexperienced.

Formalin and bluestone are the two commonest preventives, and either gives good results. Where very smutty wheat is used for seed, as it never should be, it is seldom that the smut is completely wiped out, but the regular careful use of either chemical will prevent the smut ever becoming detrimental to the value of the wheat on the market. There are several important points to bear in mind in using these preventives. The solution must be of the proper strength to kill the smut and not materially affect the vitality of the grain. The solution must be applied in such a way that every kernel is moistened. Care must be taken after the grain is treated that it is not brought into contact with fresh sources of infection. Various strengths have been recommended as satisfactory, but the following are generally regarded as reliable. To make the formalin solution dilute one pound of formalin in 32 gallons of water. This should be sufficient for 40 bushels of wheat, or 30 bushels of oats. The bluestone solution may be made by dissolving one pound of bluestone in 6 gallons of soft water.

In a trial last year with formalin on very smutty wheat, the crop showed only one head of smut in 9 square feet, and gave a yield of 34 bushels, 40 pounds per acre. The same seed untreated produced in the crop 177 smutty heads in 9 square feet and yielded only 17 bushels and 50 pounds per acre. The plot on which bluestone was used met with an accident and in consequence we have no figures to report.

EXPERIMENTS WITH OATS.

Thirty-five varieties of oats were grown in uniform test plots, and produced a yield above the average. Heavy rains in August lodged most of the varieties early but they filled well and yielded a crop of good quality, but injured somewhat in colour by rain.

The seed was sown May 20 in the proportion of two bushels to the acre on clay loam summer-fallowed the year previous.

OATS.—TEST OF VARIETIE

Number.	Name of Variety.	Date of Ripening.		No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
					In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Danish Island........	Sept.	6	109	48	Fair.. ..	9	Branching	6,780	130	..	37	Slightly.
2	Banner...............	"	4	107	51	Stiff	9	"	4,245	128	3	36½	"
3	Goldfinder...........	"	8	111	46	Fair......	10	"	5,850	127	32	34	"
4	Joanette.............	"	8	111	43	Weak	8	"	6,780	127	2	35	"
5	White Giant..........	"	8	111	51	Fair......	8	"	5,790	126	26	37	"
6	Golden Giant.........	"	8	111	46	"	10	Sided	5,810	126	6	34	"
7	Golden Beauty........	"	6	109	47	"	9	Branching	4,830	125	20	37	"
8	Improved American..	"	5	108	47	Stiff......	10	"	5,650	125	..	37½	"
9	Lincoln..............	"	6	109	47	Fair......	8	"	6,450	122	2	36½	"
10	Columbus............	"	7	110	47	Weak	9	"	5,850	122	2	34½	"
11	Kendal Black........	"	8	111	53	"	9	Sided	7,350	122	2	36½	"
12	Golden Fleece........	"	2	105	51	Fair......	9	Branching	5,470	121	16	35	"
13	Bavarian.............	"	8	111	45	Weak	8	"	6,050	119	4	35	"
14	Virginian White......	"	5	108	47	"	8	"	5,490	117	32	37½	"
15	American Triumph...	"	4	107	50	Fair......	10	"	5,030	116	26	37	"
16	Siberian.............	"	7	110	48	"	8	"	5,770	115	20	35	"
17	Black Beauty.......	"	6	109	42	Weak	10	"	4,910	114	14	37	"
18	Scottish Chief.	"	2	105	49	Stiff......	8	"	4,670	112	22	38½	"
19	Storm King..........	"	2	105	47	" . .	8	Sided	5,320	111	6	37	"
20	Irish Victor..........	"	1	104	48	"	8	Branching	5,430	110	30	36½	"
21	Abundance..........	"	5	108	48	Fair......	10	"	4,540	110	20	37	"
22	Sensation............	"	1	104	49	Stiff..... .	7	"	5,270	109	24	38½	"
23	Thousand Dollar......	"	3	106	48	Fair......	9	"	5,080	109	14	38½	"
24	Milford White........	"	5	108	47	Weak	9	Sided ...	5,780	109	14	36½	Consid'ably.
25	Swedish Milling......	"	3	106	44	Fair.....	7	Branching	4,700	105	30	39	Slightly.
26	Improved Ligowo....	Aug.	31	103	49	Stiff.. ..	7	"	4,710	105	20	38	"
27	Kendal White........	Sept.	4	107	49	"	9	"	5,540	104	24	37½	"
28	Wide Awake.........	"	5	108	47	"	8	"	4,750	104	14	37½	"
29	20th Century.........	Aug.	31	103	47	"	8	"	4,760	104	4	39	"
30	American Beauty	Sept.	3	106	48	"	8	"	4,970	100	30	37½	"
31	Swedish Selected.....	"	1	104	48	"	8	"	4,630	99	4	38	"
32	Pioneer..............	"	6	109	40	Fair......	9	"	5,320	96	16	39	Consid'ably.
33	Tartar King..........	"	2	105	48	Stiff......	8	Sided ...	4,420	90	20	38	Slightly.
34	Sixty Day............	Aug.	17	89	42	"	7	Branching	3,560	77	22	34	"
35	Daubeney.	"	17	89	42	"	6	"	3,690	76	26	34½	"

TEST OF SOWING OATS LATE.

A similar experiment was conducted with oats as with wheat to determine what return might be expected from sowing oats very late. Following are the results:—

Variety.	Date Sown.	Yield per Acre.		Weight per Bushel.
		Bush.	lbs.	Lbs.
Banner..	May 20........	128	3	36½
"	June 1........	81	26	33½
"	" 8....	74	4	32
Daubeney..	May 20........	89	42	34½
"	June 8	78	28	35

In the above table it will be noted that with Banner there is a decrease of over forty-five bushels in yield between the sowing on May 20 and June 1, and a further

decrease of seven bushels and a half by sowing on June 8. The weight per bushel is also considerably lower with the late sowing. The Daubeney is a light yielder compared with our leading varieties when sown at the usual time, but when sown very late is able to mature when many other varieties fail. There is a difference of only 11 bushels and 14 pounds between the sowings on May 20 and June 8. and with the latter sowing the quality was quite as good.

FIELD CROPS OF OATS.

Variety.	No. of Acres.	Preparation of Land.	Yield per Acre.		Total Yield.	
			Bush.	lbs.	Bush.	lbs.
Banner	5½	Third crop Fall plowed	76	..	418	..
"	9	Summerfallow	93	..	837	..
Daubeney	2¾	" "	75	25	208	9
Thousand Dollar	1⅔	" "	98	..	163	11
Tartar King	2⅓	" "	98	11	229	14
Improved Ligowo	2¼	" "	83	16	187	27
Danish Island	2½	" "	47	9	118	5
Goldfinder	¾	" "	86	25	64	36

EXPERIMENTS WITH BARLEY.

The past season has not been a favourable one for barley; the yields were well up to the average but the quality was poor in many cases. This was due to heavy rains which lodged them before they were nearly ripe, and prevented their filling properly. All the grain was badly discoloured.

Fifteen varieties of six rowed and thirteen varieties of two rowed were sown May 27. The plots were one-twentieth of an acre, and the land clay loam that had been summer-fallowed in 1906.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Oderbruch	Aug. 23	88	42	Fair	3	4,000	81	12	49	None.
2	Claude	" 23	88	44	Stiff	3	4,580	75	20	45½	Slightly.
3	Odessa	" 22	87	42	Fair	3	4,280	71	12	49	"
4	Summit	" 24	89	41	Weak	3½	4,480	71	12	48	"
5	Empire	" 24	89	43	Fair	3	4,520	70	20	47	"
6	Blue Long Head	" 24	89	41	Weak	2½	4,040	67	41	43	"
7	Mansfield	" 24	89	38	Fair	3	4,460	67	24	47½	"
8	Yale	" 24	89	39	Stiff	2½	4,160	65	20	47½	None.
9	Argyle	" 24	89	43	Fair	3	4,450	63	26	48	Slightly.
10	Stella	" 24	89	39	"	3½	4,460	63	16	48½	"
11	Mensury	" 24	89	44	Stiff	3½	4,165	61	12	48	"
12	Albert	" 23	88	40	"	3	3,340	59	28	49	"
13	Nugent	" 23	88	40	"	3	3,900	54	8	47½	None.
14	Trooper	" 23	88	38	"	3	4,070	50	30	49	Slightly.
15	Champion	" 17	82	41	"	3	3,020	35		43	"

TWO-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.	
1	Standwell	Sept. 2	97	42	Weak	3	7,700	79	8	46	Slightly.
2	Swedish Chevalier	Aug. 30	95	44	"	4	4,820	78	36	49	"
3	Jarvis	" 29	94	44	Fair	4½	5,340	72	4	48	"
4	Canadian Thorpe	" 29	94	44	Stiff	4	4,250	71	42	48½	"
5	Danish Chevalier	" 29	94	40	Weak	4	4,520	70	20	48½	"
6	French Chevalier	" 30	95	43	Fair	3½	2,840	67	44	50	"
7	Sidney	" 29	94	42	Weak	3½	5,220	64	8	49½	"
8	Durham	" 29	94	45	Stiff	4	4,640	59	28	47	"
9	Logan	" 29	94	45	Fair	3½	4,160	59	8	48	"
10	Clifford	" 28	93	46	Stiff	4	4,500	54	8	47	None.
11	Invincible	" 28	93	44	"	3½	4,270	52	34	48	Slightly.
12	Gordon	" 29	94	44	"	3½	4,690	48	6	48	None.
13	Beaver	" 28	93	44	"	4	4,040	45	..	50	"

LATE SOWING OF BARLEY.

Plots of Mensury barley were sown on several dates to determine the effect of late seeding on the yield and quality of the crop. Following are the results:—

Variety.	Sown May 27.			Sown June 1.			Sown June 8.		
	Yield per Acre.		Weight per Bushel.	Yield per Acre.		Weight per Bushel.	Yield per Acre.		Weight per Bushel.
	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.	Bush.	Lbs.	Lbs.
Mensury	61	12	48	40	20	47½	39	28	47

The yield from all these sowings while in no case very high, was fairly satisfactory.

FIELD CROPS OF BARLEY.

Variety.	Number of Acres.	Preparation of Land.	Yield per Acre.		Total Yield.
			Bush.	Lbs.	Bush.
Mensury	9¾	Summerfallow	45	26	444
Odessa	6¾	"	45	21	303

EXPERIMENTS WITH PEAS.

Twenty varieties of peas were sown on one-twentieth acre plots on May 15. The land was a clay loam summer-fallowed in 1906. The seed was sown at the rate of from two to three bushels per acre according to the size of the grain.

PEAS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per Bushel.
					Inches.	Inches.		Bush.	Lbs.	Lbs.
1	Gregory	May 15	Sept. 17	125	65	3	Large	48	20	65
2	Nelson	" 15	" 17	125	54	2½	Medium	46	20	65
3	Mackay	" 15	" 18	126	50	2½	"	46	20	66
4	Victoria	" 15	" 2	110	60	2½	"	46	10	65
5	Chancellor	" 15	" 8	116	50	2	Small	46	..	65
6	Prince	" 15	" 18	126	50	2½	Medium	44	..	64½
7	Picton	" 15	" 17	125	56	3	Small	43	40	65
8	Paragon	" 15	" 18	126	78	2½	Medium	43	10	65
9	Daniel O'Rourke	" 15	" 16	124	57	2¼	Small	41	30	65
10	Golden Vine	" 15	" 18	126	54	2	"	41	20	65
11	Wisconsin Blue	" 15	" 15	123	58	2	"	40	20	65
12	Early Britain	" 15	" 17	125	49	2¼	Large	39	50	62
13	Prince Albert	" 15	" 19	127	60	2½	Small	39	40	64
14	English Grey	" 15	" 17	125	54	2½	Medium	39	20	62
15	Arthur	" 15	" 14	122	52	2½	"	38	20	66
16	Archer	" 15	" 18	126	76	2½	Small	38	20	65
17	Black Eye Marrowfat	" 15	" 21	129	46	2¼	Large	37	20	64
18	Prussian Blue	" 15	" 13	121	56	2½	Medium	36	50	65
19	White Marrowfat	" 15	" 20	128	76	3	Large	27	..	64
20	Agnes	" 15	" 14	122	58	2½	Medium	24	40	64½

The harvesting was done by means of a pea harvester attachment to the mower. Where the straw is not extremely long the bunchers can also be used satisfactorily. No difficulty was experienced in threshing with the ordinary separator, and after the concaves were removed a comparatively small proportion of the peas was split.

FIELD CROPS OF PEAS.

All the field peas were grown on summer-fallow.

Variety.	Number of Acres.	Yield per Acre.		Total Yield.	
		Bush.	Lbs.	Bush.	Lbs.
Golden Vine	2½	39	51	99	37½
Daniel O'Rourke	1¾	35	52	62	46
Arthur	1¾	44	34	77	59½

EXPERIMENT WITH SPRING RYE.

One-twentieth of an acre of Spring Rye was sown on May 27 and a good crop harvested. The yield was 52 bushels 18 pounds of grain per acre, weighing 57 pounds per bushel, and 2 tons 1,470 pounds of straw.

Two acres of Spring Rye was sown to test its merits as a nurse crop for clover and grasses. Its value for this purpose cannot be stated definitely, as the clovers although they made a fairly good start, have yet to be subjected to winter conditions. The rye was harvested before fully ripe and sold to collar makers. From the two acres 7 tons, 585 pounds of straw was produced.

ROTATION OF CROPS.

Several years ago some work was undertaken to demonstrate the feasibility of eliminating the bare summer-fallow from the system of grain growing followed in this province. The system outlined provided for the growing and plowing under of some leguminous crop every third year instead of letting the land lie fallow.

The first few years' work was lost through the land chosen being repeatedly flooded, and a new series was started in 1905.

The following table gives the kind of crop and the yield, grown on each of the seventeen plots for the first three years:—

Number.	1905.			1906.			1907.		
	Crop.	Yield		Crop.	Yield.		Crop.	Yield.	
		Bush.	Lbs.		Bush.	Lbs.		Bush.	Lbs.
1	Peas	....	..	Wheat	33	30	Wheat	29	..
2	Tares	....	....	Wheat	33	30	Oats	56	6
3	Red Clover			Wheat	30	40	Wheat	30	20
4	Alfalfa and Alsike			Wheat	30	10	Barley	39	18
5	Wheat	35	50	Wheat	30	10	Peas		
6	Wheat	36	20	Oats	102	22	Tares		
7	Wheat	35	..	Wheat	27	50	Red Clover		
8	Wheat	33	..	Barley	52	4	Alfalfa and Alsike		
9	Wheat	33	30	Peas			Wheat	39	40
10	Oats	105	..	Tares			Wheat	37	10
11	Wheat	35	20	Red Clover			Wheat	42	10
12	Barley	40	10	Alfalfa and Alsike			Wheat	41	20
13	Wheat	35	40	Wheat	28	50	Summerfallow		
14	Wheat	35	10	Oats	85	..	Summerfallow		
15	Wheat	38	10	Barley	46	22	Summerfallow		
16	Wheat	35	10	Wheat	28	40	Oats	105	.
17	Wheat	35	50	Barley	46	12	Oats	95	30

EXPERIMENTS WITH INDIAN CORN.

About six acres of Indian corn were grown here last year and furnished a large proportion of the feed used by the cattle through the winter. Two small silos were filled and the remainder has been fed as dry fodder, being drawn from the field and run through the cutting box as required.

Owing to our short season the different sorts of fodder corn do not become sufficiently matured to make the best quality of feed. Even the earliest varieties that have been grown here seldom mature past the early milk stage, and last year as the sowing was delayed by the backward spring until June 8, it was only in tassel when cut. As we considered this too green to put in the silo at once, it was allowed to lie in the sheaf for about a week to wilt. It was then cut into the silos and well tramped. The silage produced is sweet and of excellent quality, and has been regularly fed to the milking cows without tainting the milk in the least.

Although the varieties now grown yield a large amount of excellent feed, there is an apparent need of earlier varieties of fodder corn—varieties that will at least reach the glazed stage before time for cutting. The fodder produced would be much richer and would produce sweeter silage more easily handled. With the object of securing such a corn, we obtained seed that had been ripened in Manitoba of several varieties. This was sown in the hope that some of it would mature under our conditions, but the season was such an unfavourable one for corn that the results were very unsatisfactory. However, a few ears of Northwestern Dent were obtained which

were sufficiently matured to grow, and from these we may be able to get better results another year.

Twenty-one varieties of corn were grown in the trial plots this year. The chief object in growing these various sorts is to ascertain which will produce the most satisfactory green fodder under the conditions of climate which prevail at Brandon. They were sown June 6 in rows 40 inches apart on clay loam, summer-fallowed in 1906. The yield per acre in each case was calculated from two rows each, 66 feet long.

Indian Corn—Test of Varieties.

Number.	Name of Variety.	Date of Sowing.	Character of Growth.	Height.	Leafiness.	Condition when Cut.	Weight per Acre Grown in Rows.	
				Inches.			Tons.	lbs.
1	King Philip	June 6.	Fair	97	Leafy	Silk	21	966
2	Wood's Northern Dent	" 6.	Very rank	96	"	Tassel	21	174
3	Salzer's All Gold	" 6.	"	88	"	"	20	1,580
4	Longfellow	" 6	Fair	88	Very leafy	Silk	20	1,778
5	Early Leaming	" 6.	"	91	Leafy	"	20	1,184
6	North Dakota White	" 6.	Rank	87	Very leafy	"	20	1,382
7	Selected Leaming	" 6.	Very rank	95	Leafy	Tassel	20	788
8	Angel of Midnight	" 6	Fair	93	"	Silk	20	510
9	Compton's Early	" 6.	"	87	"	"	19	412
10	Early Mastoden	" 6.	Rank	94	"	Tassel	19	214
11	Early Butler	" 6.	"	89	Very leafy	"	19	16
12	Giant Prolific Ensilage	" 6.	"	96	Leafy	Not in tassel	18	1,422
13	Cloud's Early Yellow	" 6.	"	98	"	Tassel	18	234
14	Eureka	" 6.	Very rank	98	Very leafy	"	17	848
15	Superior Fodder	" 6.	"	93	Leafy	"	17	452
16	Pride of the North	" 6.	Fair	90	Very leafy	Silk	17	254
17	White Cap Yellow Dent	" 6.	"	90	Leafy	"	17	56
18	Champion White Pearl	" 6.	Very rank	96	Very leafy	"	15	690
19	Early Longfellow	" 6.	Fair	78	"	"	14	1,502
20	Mammoth Cuban	" 6.	"	96	"	Tassel	13	1,720
21	Red Cob Ensilage	" 6.	Very rank	94	"	"	13	334

Indian Corn Sown at Different Distances Apart.

Number.	Variety.	Distance Apart.	Height.	Condition when Cut.	Weight per Acre.	
		Inches.	Inches.		Tons.	lbs.
1	Longfellow	24	84	Silk	17	1,310
2	"	30	84	"	17	1,640
3	"	36	88	"	15	1,240
4	"	42	86	"	16	45
5	Champion White Pearl	24	92	Tassel	17	1,970
6	" " "	30	92	"	18	1,848
7	" " "	36	93	"	15	360
8	" " "	42	92	"	16	1,364
9	Selected Leaming	24	84	"	22	1,540
10	" "	30	90	"	23	200
11	"	36	94	"	19	1,380
12	" "	42	94	"	19	164

EXPERIMENTS WITH FIELD ROOTS.

A greater interest is yearly being taken in field roots although they are still grown in comparatively small quantity in Manitoba. For stock of all kinds, horses, cattle, swine and chickens, a few fed through the winter are always beneficial. For milch cows, growing calves, and brood sows they are almost necessary for best results.

Large yields of excellent quality can be obtained in this climate, and they deserve more attention at the hands of the stockmen of this province.

Two sowings were made as usual this year and as appears always to have been the case here, the earliest sown gave the heaviest yield.

EXPERIMENTS WITH TURNIPS.

In Manitoba early sown turnips are not woody in texture as is commonly the case in other parts of Canada. They can therefore be sown early in May or as soon as the ground is in good condition.

Twelve varieties of turnips were sown this year on clay loam. The first sowing was made on May 22, the second June 5. Both sowings were pulled October 28. The estimate of yield per acre was made from two rows, each 66 feet long.

Experiments with Turnips.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	lbs.	Bush.	lbs.	Tons.	lbs.	Bush.	lbs.
1	Perfection Swede	34	904	1,148	24	19	1,864	664	24
2	Hall's Westbury	33	1,848	1,130	48	23	464	774	24
3	Mammoth Clyde	32	1,736	1,095	36	27	1,176	919	36
4	Skirvings	32	1,208	1,086	48	21	1,032	717	12
5	Halewood's Bronze Top	31	40	1,034	..	17	848	580	48
6	Magnum Bonum	28	496	941	36	15	1,152	519	12
7	Good Luck	26	1,856	897	36	15	1,944	532	24
8	Carter's Elephant	26	1,328	888	48	14	1,304	488	24
9	Bangholm Selected	25	1,216	853	36	18	1,224	620	24
10	Hartley's Bronze	25	952	849	12	17	1,640	594	..
11	Kangaroo	24	1,632	827	12	15	96	501	36
12	Jumbo	24	840	814	..	14	1,040	484	..

EXPERIMENTS WITH MANGELS.

Mangels are particularly valuable as feed for dairy cows as there is no danger of their affecting the quality of the milk.

They should be sown as soon as danger from frost is past, and pulled early enough to prevent injury from fall frost as they are very susceptible to even a slight frost. Frost greatly injures their keeping qualities.

Ten varieties were sown this year on clay loam in rows 2 feet apart, the first sowing was made on May 22, the second on June 5. They were pulled on October 3. The estimate of the yield per acre was made from two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Prize Mammoth Long Red	27	1,704	928	24	23	1,520	792	..
2	Gate Post	26	536	875	36	21	1,821	730	21
3	Perfection Mammoth Long Red	24	840	814	..	20	1,184	686	24
4	Half Sugar White	24	576	809	36	22	88	734	48
5	Giant Yellow Intermediate	23	1,520	792	..	21	240	704	..
6	Yellow Intermediate	23	992	783	12	21	1,032	717	12
7	Selected Yellow Globe	22	1,408	756	48	17	56	567	36
8	Crimson Champion	20	128	668	48	16	1,528	558	48
9	Giant Yellow Globe	19	16	633	36	16	1,792	563	12
10	Mammoth Red Intermediate	17	1,640	594	..	14	512	475	12

EXPERIMENTS WITH CARROTS.

The yield of carrots this year was somewhat below the average of recent years.

Six varieties were sown on clay loam in rows eighteen inches apart. The first sowing was made on May 22 and the second on June 5. They were both pulled on October 29.

The yield per acre is estimated from the product of two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	24	400	806	40	18	960	616	..
2	Mammoth White Intermediate	20	700	678	20	16	120	535	20
3	Ontario Champion	20	480	674	40	19	60	634	20
4	Giant White Vosges	18	960	616	.	18	1,400	623	20
5	White Belgian	15	1,900	531	40	15	800	513	20
6	Half Long Chantenay	15	800	513	20	17	1,640	594	..

EXPERIMENTS WITH SUGAR BEETS.

Several varieties of sugar beets have been discarded and only those sown which are considered suitable to grow for the production of sugar. The other varieties are somewhat of the nature of a mangel but have a higher sugar content than mangels and make excellent stock feed. Sugar beets and sugar mangels are particularly relished by swine, and are eaten with relish when other kinds of roots are not favoured.

Samples of the three varieties grown here this year were sent to Mr. F. T. Shutt, Chemist of the Experimental Farms, for analysis, and the results are given herewith.

	Sugar in juice.	Co-efficient of purity.
Vilmorin's Improved.	16·75	85·6
Wanzleben	17·86	84·5
French Very Rich	16·38	85·4

This is considered a fair showing, and we may conclude that the season was fairly suitable for the production of sugar. Last year the results were very similar but in 1905 the proportion of sugar was much lower.

The first sowing was made on a clay loam on May 22, and the second on June 5. The roots from both were pulled October 3. The yield per acre is estimated from the product of two rows, each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Wanzleben.	18	1,224	620	24	15	1,152	519	12
2	Vilmorin's Improved.	18	696	611	36	17	320	572	..
3	French Very Rich.	13	1,984	466	24	12	1,608	426	48

EXPERIMENTS WITH POTATOES.

Although the yield of potatoes was somewhat below the average at this farm, a good crop was harvested, the average of twenty-nine varieties being 433 bushels, 44 pounds per acre. Owing to the cool backward season some of the varitiee failed to mature, but the quality for the most part was excellent.

Potato beetles were more prevalent here and at many points in Manitoba than usual during 1907, but they were controlled by spraying early with Paris Green, prepared by mixing four ounces in one barrel of water. This can best be applied with a spray pump. If only a small quantity is required the mixture may be made by mixing one tea spoonful of Paris Green with a pail of water. This should be applied as often as the beetles make their appearance.

Twenty-nine varieties of potatoes were planted on May 23, in rows two and a-half feet apart. The soil was a sandy loam mixed with clay that had produced a crop of roots the previous year. There was no loss from rot. The yield was estimated from the product of two rows each 66 feet long. The potatoes were dug October 10.

POTATOES—TEST OF VARIETIES.

Number.	Name of Variety.	Planted.	Dug.	Character of Growth.	Average Size.	Yield per Acre. Total. Bush.	Total. Lbs.	Marketable. Bush.	Marketable. Lbs.	Unmarketable. Bush.	Unmarketable. Lbs.	Form and Colour.
1	Collin's Seedling...	May 23	Oct. 10	V. rank..	Small to med.	597	40	586	40	11	00	Round, white.
2	State of Maine....	" 23	" 10	" ..	" .	550	..	537	10	12	50	Flat oval, white.
3	Early Envoy.......	" 23	" 10	Rank.....	Med. to large.	544	30	515	10	29	20	Round, pink.
4	Uncle Sam.........	" 23	" 10	V. rank..	" .	533	30	515	10	18	20	Flattish oval, wh.
5	Late Puritan.......	" 23	" 10	Rank.....	" .	509	40	484	..	25	40	Long round, wh.
6	Holborn Abundance.	" 23	" 10	V. rank..	" .	495	..	473	..	22	..	Round, white.
7	Money Maker......	" 23	" 10	Rank.....	Small to med.	489	30	467	30	22	..	Round oval, wh.
8	Empire State.......	" 23	" 10	"	Med. to large.	485	50	462	..	23	50	Long, white.
9	Early White Prize..	" 23	" 10	Fair......	Medium.....	460	10	434	30	25	40	Rd. oval, lt. pink.
10	Maule's Thoro'bred.	" 23	" 10	V. rank..	Med. to large.	460	10	438	10	22	..	Long, pink.
11	Everett	" 23	" 10	Fair... ..	" .	454	40	436	20	18	20	Long oval, pink.
12	Vermont Gold Coin.	" 23	" 10	V. rank..	Large........	447	20	434	30	12	50	White, round.
13	Sabean's Elephant..	" 23	" 10	" ..	Med. to large.	445	30	425	20	20	10	Long round, wh.
14	Irish Cobbler.......	" 23	" 10	Rank.....	" .	438	10	407	..	31	10	Flat, white.
15	Ashleaf Kidney.....	" 23	" 10	V. rank..	Large.. ...	425	20	412	30	12	50	Long, white.
16	Country Gentleman.	" 23	" 10	Rank. ...	Med. to large.	425	20	401	30	23	50	Long, pink.
17	Morgan Seedling....	" 23	" 10	Fair......	Large........	423	30	410	40	12	50	"
18	Carman No. I......	" 23	" 10	Rank.....	Medium.....	421	40	408	50	12	50	Flat, white.
19	Reeve's Rose.......	" 23	" 10	"	Med. to large.	421	40	403	20	18	20	Flat oval, lt. pink.
20	American Wonder..	" 23	" 10	V. rank..	Large.......	403	20	381	20	22	.	Long round, wh.
21	Vick's Extra Early..	" 23	" 10	" ..	Small to med.	394	10	381	20	12	50	Flat, pink.
22	Canadian Beauty...	" 23	" 10	Fair......	Medium.....	392	20	377	40	14	40	Lg. round, lt. pink
23	Early Rose.........	" 23	" 10	"	Small to med.	390	30	377	40	12	50	Long round, pink
24	Dooley.............	" 23	" 10	V. rank..	Large...	366	40	353	50	12	50	Round, white.
25	Dreer's Standard....	" 23	" 10	" ..	Med. to large.	361	10	342	50	18	20	Flattish oval, wh.
26	Burnaby Seedling...	" 23	" 10	Fair......	" .	352	..	337	20	14	40	Flat oval, pink.
27	Rochester Rose.....	" 23	" 10	Rank.....	Small to med.	339	10	326	20	12	50	Lg. round, lt. pink
28	Dalmeny Beauty ...	" 23	" 10	V. rank..	Large........	330	..	319	..	11	..	White, oval.
29	Bovee	" 23	" 10	Fair......	Medium.....	220	..	207	10	12	50	Lg. oval, lt. pink.

GRASSES AND CLOVERS.

The early part of the season was so cold and backward that there were but poor prospects for hay, but June was favourable and a fair crop was harvested. Some of the older seedings of brome grass had become matted and produced only a short crop.

The plots of grasses that were seeded in 1903 had become so intermixed, and in many cases so thin, that it was not considered advisable to keep a record of their yield.

One-fifth acre plots were sown of the following clovers, grasses and mixtures:—

Alfalfa (Utah Seed), Common Red Clover, Alsike Clover, Timothy, Western Rye Grass, Western Rye Grass and Red Clover, Timothy and Alsike, Timothy and Red Clover.

One-twentieth of an acre of Alfalfa was sown with seed ripened at the Experimental Farm at Indian Head in 1906. This seed germinated well and the alfalfa made a good stand. It will be interesting to observe whether the crop from this seed is any more hardy than that produced from southern grown seed. These plots were sown June 11 on summer-fallow. A double disk drill was used and the seed sown in the same way as grain, the amount of seed being regulated by mixing it with coarsely chopped grain. By sowing in this way the seed was evenly distributed and well covered. The season was favourable and an excellent catch was secured. The mower was run over all the plots twice during the summer and the cut weeds were allowed to remain as a mulch.

Additional grass plots are to be sown in 1908.

Avenue of Native Maple (*Acer Negundo*) at the Experimental Farm, Brandon, Man. Photo by C. E. Saunders.

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EXPERIMENTS WITH NURSE CROPS FOR CLOVERS.

For ten years there has been little difficulty experienced on this farm in getting a good catch of clover by seeding it alone—that is without what is commonly called a nurse crop. Occasionally a fairly good catch has been obtained but there has been more trouble with winter killing with crops grown with a nurse crop than when sown alone. It would appear that where clover has been grown for several years less difficulty is experienced in getting a good catch and we have therefore again tried several clovers with different nurse crops.

Oats, barley, and spring rye were sown as nurse crops for each of the following grasses and clovers: Red clover, alsike, rye grass, timothy, and a mixture of timothy, red clover and alsike. Each of these was also grown without a nurse crop. About two acres of alfalfa sown without a nurse crop made a splendid showing the first season, and went into the winter in good condition.

The crops of oats, barley and rye were all heavy and lodged, but the clovers and grasses made a good start, although not nearly so strong a growth as those sown alone.

EXPERIMENTS WITH MILLETS.

Six varieties of Millet were sown June 10 on sandy loam. A crop somewhat below the average was produced.

The smaller growing varieties of Millet—the Common and Hungarian can be used as a partial substitute for hay. There is little danger in feeding to cattle, but care has to be exercised in feeding to horses. It should be cut with the binder as soon as the head is well formed and cured in stooks.

MILLET.

Variety.	Description.	Height.	Stage when Cut.	Yield of Hay per Acre.	
		Inches.		Tons.	Lbs.
Hungarian	Fine quality	35	Seed nearly ripe	5	312
Algerian	Very coarse	52	Few heads showing	5	1,250
Italian	Rather coarse	29	"	4	437
French	"	36	Seed nearly ripe	3	875
Common	Fine quality	32	"	3	718
Pearl	Fair quality	24	No heads showing	3	250

CATTLE.

The herd of cattle on this farm now consists of twenty-nine animals, as follows:—

Name.	Breed.	Age.
Gordon Keith	Shorthorn	2 years.
Nemo	"	14 months.
Rose	"	5 years.
Crocus	"	4 "
Daisy	"	4 "
Jane	"	2 "
Hazel	"	7 months.
Poppy	"	6 "
Pansy	"	5 "
Roan Queen	"	3 "
Westward Ho	Ayrshire	2 years.
Reliance	"	1 month.
Lily	"	6 years.
Snowball	"	4 "

CATTLE—*Continued.*

Name.	Breed.	Age.
Marie	Guernsey	4 years.
Christie	Grade	10 "
Gretchen	"	11 "
Sis	"	5 "
Jennie	"	5 "
Julia	"	4 "
Louise	"	2 "
Buttercup	"	2 "
Elane	"	2 "
Major	"	1 "
Primrose	"	9 months.
Tiger	"	9 "
Ruben 2nd	"	4 "
Margaret	"	4 "

FEEDING STEERS.

Two-Year Olds vs. Three-Year Olds.

Twelve steers, six two-year olds, and six three-year olds were bought late in November, and on December 5 were started on the following rations:—

Two-year Olds.		Three-year Olds.	
11 pounds	Silage,	15 pounds	Silage,
5 "	Straw,	10 "	Straw,
3 "	Hay,	4 "	Hay,
12 "	Roots,	15 "	Roots,
½ "	Linseed,	½ "	Linseed,
2 "	Grain (oats and barley).	4 "	Grain (oats and barley).
Increased by 2 pounds per month.		Increased by 2 pounds per month.	

These rations were fed until April 21, when the steers were sold at 4.60 per pound.

Following is a detailed statement of the transaction:—

STEERS TWO-YEARS OLD.

Number in lot	6	
First weight gross	4,795	lbs.
First weight average	799	"
Finished weight gross	6,325	"
Finished weight average	1,054	"
Total gain in 121 days	1,530	"
Gain per steer	255	"
Gain per steer per day	2·1	"

COST OF FEED.

Gross cost of feed	$ 69 12
Original cost of steers, 4,795 lbs. at $3.50	167 92
	237 04
Selling price of steers, 6,325 lbs. at $4.60	290 95
Gain	53 91
Gain per steer	8 99

STEERS THREE-YEARS OLD.

Number in lot	6	
First weight gross	6,640	lbs.
First weight average	1,106·6	"
Finished weight gross	7,930	"
Finished weight average	1,321·6	"
Total gain in 121 days	1,290	"
Gain per steer	215	"
Gain per steer per day	1·7	"
Gross cost of feed	$ 92 43	
Original cost of steers, 6,640 lbs. at $3.50	232 40	
	324 83	
Selling price of steers 7,930 lbs. at $4.60	364 78	
Gain	39 95	
Gain per steer	6 66	

SUMMARY OF RESULTS.

——	First Cost per Steer.	Value of Feed.	Selling price per Steer.	Gain per Day.	Profit per Steer.
	$ cts.	$ cts.	$ cts.	Lbs.	$ cts.
Two year old steers	27 98	11 52	48 49	2·1	8 99
Three year old steers	38 73	15 40	60 79	1·7	6 66

FATTENING STEERS OUTSIDE.

For a number of years the cattle feeding business in Manitoba has been on the wane owing largely to the low prices that have ruled for beef. The small profits to be realized have been out of proportion to the amount of capital required for buildings and equipment and the cost of labour. The value of the manure which is considered by many cattle feeders as equivalent to the cost of labour, is not generally regarded so in Manitoba. The inducement to feed cattle has to be, therefore, that it offers a better market for the coarse grains than to sell them directly off the farm. The tendency to grow more oats and barley is becoming greater every year as their usefulness as cleaning crops is demonstrated, and, as diversified farming becomes more general, their growth will be stimulated further.

One of the deterring factors to the more extensive feeding of steers has been the amount of capital required to house them in comfortable quarters. Buildings of any kind are expensive, and those that are strictly essential are generally all that the average farmer cares to build. He is quite reasonably averse to putting money into buildings in which to feed stock when the profits from feeding are at best meagre. To overcome this serious objection, a system of feeding has been advocated with which the cattle are allowed to run outside without any shelter. The strongest advocates of this system are men who have been practising it successfully for several years. By this method the stock, steers of about 1,100 to 1,300 pounds, kept in the open throughout the winter, are fed straw and chopped grain and allowed abundance of water. The claim is made that steers handled in this way make good gains economically, do not suffer from the cold, and can be handled with infinitely less care

and with the outlay of much less capital than when comfortable quarters are provided.

So important did this question appear that it was considered advisable to initiate some work to test the feasibility of the system, and to compare the average returns with those obtained by feeding in a comfortable stable. Accordingly a carload of three-year old steers were purchased and divided as evenly as possible into two lots, nine head being put outside and eight in the stable. Those outside were given no shelter other than that afforded by poplar and oak scrub and several coulees, no sheds or wind breaks were provided. The only outlay by way of equipment was the plank required to make a trough in which to feed the grain.

The inside lot were fed a standard ration composed of straw, hay, silage, a few roots and grain; those outside were fed oat straw and grain and bran, with a little coarse hay, and allowed access to water. These rations are considered to be somewhat similar to what would be fed by feeders following either system.

The experiment is still under way and cannot be fully reported on until it is completed. The steers under both conditions have thriven splendidly and for such a winter as we have had this year—unusually mild and free from storms—the results should be quite reliable even if not conclusive. The intention is to continue this work for several years.

SWINE.

The swine on hand at present consists of 36 head, as follows:—

2 Yorkshire boars.
1 Berkshire boar.
2 Yorkshire sows.
1 Tamworth sow.
1 Berkshire sow.
29 Young pigs.

Several experiments are now in progress with frozen wheat to get some further information regarding its feeding value for pigs. The results will be reported next year.

BEES.

The past year has been a poor one for bees. The spring and early summer were cold and backward, and several weak swarms succumbed. The summer temperature was below normal, and the crop of honey was smaller than it has been for several years. Fifteen hives were put into their winter quarters on December 1. This is much later than usual, but the unusually open weather permitted their remaining on their summer stands until this date.

HORTICULTURE.

The extremely cold backward weather early in the season did not promise well for the garden, but when spring finally opened up splendid growing weather followed. Throughout the summer conditions for gardening were ideal, with abundance of sunshine and moisture. The early August frosts which wrought so much damage in some parts of Manitoba did practically no harm here, so that nothing was injured until the severe frosts toward the middle of September, and by that time most of the vegetables had matured. Late ripening crops were however somewhat injured.

The severe cold of the previous winter did not do the amount of damage that might have been expected. The fruit trees that had wintered satisfactorily before came through uninjured, and with many varieties the amount of damage was much less than in some previous years. Spring opening late there were no damaging frosts after growth had started and no injury was done the fruit blossoms. In consequence we had a good crop of those varieties which succeeded here.

Small fruits with the exception of currants gave only a fair crop; the currants yielded bountifully. Raspberries and strawberries gave a light crop as did also gooseberries.

In the Arboretum probably the greatest loss was two Weeping Cut Leaved Birch (*Betula alba laciniata pendula*) which had withstood many severe winters but this year were killed back badly. Several other specimens survived however without injury.

Additional material was received for the Arboretum but space did not permit of its being planted in permanent location, and it was therefore planted in the nursery for a year.

The various kinds of flowering shrubs that are well established bloomed bountifully and were greatly admired. The most noteworthy of these were the Lilacs and Caraganas. The several kinds of both of these are perfectly hardy and deserve to be planted more largely. Others much admired were the Spireas, Honeysuckles, Hawthorns, Cotoneasters, and the Asiatic Maples. These all are hardy and worthy of being extensively grown.

ORCHARDS.

While apple growing is not likely soon to become a commercial enterprise in Manitoba, progress is being made from year to year, and there now are a large number of varieties fruiting which are valuable. A number of trees now well established yielded good crops, among which were Duchess, Hibernal, Transcendent, Hyslop, Martha, No. 179, and Repka Kislaga. The last named variety bore fruit here for the first time. The variety is of Russian origin, and produces fruit about the size of Duchess and of fully as good quality.

We suffered considerably last year from blight in the apple orchards. To control it we followed the system usually recommended, that of cutting out infected branches as soon as they were noticed, but in spite of this a number of trees were killed with the disease. The Pyrus baccata seems to be quite as subject to blight as the apple trees and several of these as well as a number of the cross bred sorts succumbed.

VEGETABLES.

CABBAGE.

Sown, April 5. Transplanted, May 30.

Variety.	Average Weight.	Description.
	Lbs.	
Early Paris Market	$6\frac{1}{2}$	Solid.
" Savoy	$6\frac{1}{2}$	Good.
" Jersey Wakefield	$7\frac{1}{2}$	Solid.
Tottle's Imported Brunswick	12	Good.
Dutch Drumhead	14	Very solid.

TOMATOES.

Sown April 3; Transplanted June 10.

Many of the later varieties were not ripe when they were killed by the September frosts. The earlier varieties however produced heavy crops and ripened splendidly. The Earliana is considerably the earliest variety tried and seems to be better adapted for general growth than any of the others where ripe fruit is desired. Some of the later varieties are heavier croppers.

Variety.	Ripened.	Appearance.	Germination.
Earliana	September 5	Wrinkled.	Very good.
Red Peach	Did not ripen.	Slightly wrinkled	Poor.
Early Jewel	September 15	Smooth	Good.
Paragon	" 17	Wrinkled	"
Ignotum	Did not ripen	Smooth	Very good.
Red Plum	September 12	Smooth; plum shaped.	"
Acme	" 14	Smooth	"
New Jersey	" 14	Slightly wrinkled	Poor.
Creekside Glory	" 10	Smooth	Good.
Livingstone Dwarf Stone	" 14	"	Poor.
Century	" 18	"	Fair.
Lorillard	" 12	"	Good.
Perfection	" 14	"	Poor.
Thorburn's Earliest	" 10	Slightly wrinkled	Fair.
Success	" 18	" "	Good.
Stirling Castle	" 19	Smooth	Fair.
Improved Trophy	Did not ripen	"	Good.
Early Ruby	September 12	"	"
Frogmore Selected	" 16	"	Fair.
Freedom	" 18	"	Good.
Thorburn's 1903	" 12	Pear shaped	"
Red Pear	" 10	"	"
Matchless	Did not ripen	Smooth	Very poor.
Enormous	September 16	"	Poor.
Beauty	" 16	"	"
Ponderosa	Did not ripen	Wrinkled	Good.
Favourite	September 16	Smooth	Fair.
Steele Brigg's Earliest of All	" 10	Wrinkled.	Very good.
Stone	Did not ripen	Smooth	Good.
Table Queen	" "	Slightly wrinkled	Fair.
Magnus	September 12	Smooth.	Good.
Atlantic Prize	" 14	Wrinkled	Poor.
Imperial	Did not ripen.	Smooth	Good.
Royal Red	September 14	"	"
Honor Bright	Did not ripen	"	Poor.
Terra Cotta	" "	"	"
Crimson Cushion	" "	Slightly wrinkled	Very poor.
Thorburn's Democrat	" "	Smooth	Fair.
Buckeye State	September 18	"	Good.
Thorburn's Lemon Blush	" 12	"	"

The following did not germinate:—

Thorburn's Rosalind, Station Upright Tree, Dwarf Champion, Strawberry, Thorburn's Long Keeper, Sutton's Best Of All.

CAULIFLOWER.

Sown April 5, Transplanted June 6.

Variety.	Ready for use.	Description.	Average Weight.	Germination.
			Lbs.	
Early Paris	Aug. 10	Good	10	Good.
Large Algiers	" 12	"	14	Very good.
Early London	" 10	"	6	Good.
" Walcheren	" 10	Poor	6	"
Autumn Giant	" 24	Very good	6	Fair.
Thorburn's Gilt Edge	" 14	"	10	"
Large Early Dwarf Erfurt	" 14	"	9	Very good.
Denmark	" 14	"	8	Good.
Ex. Early Snowball	" 10	"	9	"
Thorburn's Large Early Snowball	" 12	Good	13	Poor.
Simmers Gilt Edge	" 12	Poor	9	Good.
Early Erfurt	" 10	Good	7	"
Ex. Early Paris	" 10	Very good	13	"
Earliest Selected Dwarf Erfurt	" 10	"	6	"
Early Snowball	" 16	"	6	"
Steele Briggs Earliest White Head	" 13	Good	7	"
LeNormands Ex. Large	" 13	Poor	6	Poor.
Early Large Erfurt Market	" 13	"	7	"

The following did not germinate:—
Erfurt Market and Extra Early Dwarf Erfurt.

CUCUMBERS.

Sown in the open on May 25 in hills eight feet apart each way. A good yield of excellent quality was obtained.

Variety.	Average Weight.	Productiveness.
	Oz.	
Long Green Improved	10	Very productive.
Evergreen White Spine	9	Fairly "
Giant Pera	12	Very "

SQUASH AND PUMPKINS.

Sown in the open on May 25 in hills eight feet apart each way. The Long White Bush Marrow gave an exceptionally heavy yield.

Variety.	Colour.	Average Weight.	Quality.
		Lbs.	
English Vegetable Marrow	Yellowish	8	Very good.
Golden Hubbard	Dark Yellow	7	"
Mammoth Whale	Light Green	27	Feed.
Chicago Warty Hubbard	Dark "	11	Very good.
Golden Bush Scalloped	Yellow	4	Good.
Hubbard	Dark Green	11	Very good.
Long White Bush Marrow	Yellowish	9	"
Orange Marrow	Orange	11½	"
Connecticut Field	Deep Yellow	28	Poor.
Sweet or Sugar	"	6	Very good.
Japanese Pie	Dark Yellow	8	"

GARDEN TURNIPS.

Sown in the open on May 8 in rows two and a half feet apart. The yield per acre has been calculated from the yield of one row, 66 feet long.

Variety.	Ready.	Flavour.	Yield per Acre.	
			Tons.	Lbs.
Early White Milan	July 5	Good	32	370
Early White Strapleaved	" 5	"	48	1,680

PARSNIPS.

Sown in the open on May 8, and lifted October 21. The yield per acre has been calculated from the yield of one row, 66 feet long.

Variety.	Flavour.	Yield per Acre.	
		Bush.	lbs.
Manitoba Prize Intermediate	Good	610	30

GARDEN PEAS.

Variety.	Sown.	Ready for Use.	Productiveness.
American Wonder	May 8	June 13	Very productive.
Gradus	" 8	" 15	" "
Nott's Excelsior	June 21	August 16	Poor.
Champion of England	" 21	" 26	Fairly productive.

BEANS.

Sown in the open on May 25 in rows two feet apart.

Variety.	Ready for Use.	Length of Pod.	Productiveness.
Dwarf Extra Early	August 8	5 inches	Fairly productive.
Dwarf Matchless	" 10	5 "	" "
Fame of Vitry	" 10	5¾ "	Very "
Emperor of Russia	" 12	6 "	" "

CARROTS.

Sown in the open on May 8 in rows two feet apart. The yield per acre has been calculated from the yield of one row, 66 feet long.

Variety.	Flavour.	Lifted.	Yield per Acre.	
			Bush.	lbs.
Half Long Chantenay	Good	October 21	1,474	..
French Horn	"	" 21	539	4

ONIONS, SEED.

Sown in the open on May 8 in rows one foot apart. The yield has been calculated from the crop of one row, 66 feet long.

Variety.	Lifted.	Shape.	Yield per Acre.
			Bushels.
Large Red Wethersfield	Sept. 24	Flattish	429
Danver's Yellow Globe	" 24	Globular	330
Paris Silverskin	Aug. 30	Flattish	154

ONIONS (SETS).

The onion sets produced an average crop. Two varieties were planted on May 8, viz.: Shallots and Yellow Dutch Sets.

BEETS.

Three varieties of Beets, namely, Early Blood Red Turnip, Egyptian Dark Red and Nutting's Dwarf Improved, were sown in the open on May 25 in rows two feet apart.

Variety.	Shape.	Lifted.	Yield per Acre.	
			Bush.	lbs.
Early Blood Red Turnip	Turnip	Sept. 30	1,232	..
Egyptian Dark Red	"	" 30	954	..
Nutting's Dwarf Improved	Long	" 30	425	20

CORN.

Sixteen varieties of sweet corn were tested here this season. Owing to the severe frosts in September, none of the varieties ripened. Sown May 27 to May 29. The following are the results.

Variety.	Ready.	Flavour.
Early Primo	Sept. 14	Good.
Peep O'Day	" 14	"
Golden Bantam	" 10	Very good.
Aitken	" 10	Good.
Woodstock	" 8	Very good.
Vermont Sweet	" 12	"
Malakoff	" 14	Good.
Johnston's Early	" 1	Very good.
Pocahontas	" 10	"
Hiawatha	" 18	Good.
Country Gentleman	" 18	"

Many other varieties of standard vegetables not referred to in the foregoing were tested during the season, including Lettuce, Citron, Salsify, &c., with good results.

The Rhubarb under test also gave heavy returns.

FLOWER GARDEN.

The flower garden this year was again very attractive, the numerous visitors making many favourable comments.

Though the prospect at planting out time was not very promising on account of the drought, the water supply was sufficient to carry the beds through the critical time, and the rains during the remainder of the season caused a very strong growth and a profusion of flowers. In the annuals, stocks, asters, verbenas, and petunias were specially fine.

Fifty-three varieties were sown in the greenhouse April 2-5 in boxes, and bedded out June 3-5, while twenty-eight varieties were sown outside June 2; these also gave a magnificent display.

HERBACEOUS PERENNIALS.

The paeony is one of the most attractive flowers in the early part of the season, and is worthy of special mention. Being adapted in every way to this climate, it is singular that these are not more largely grown throughout the province. The blooms are larger and more magnificent than the rose, and some of them quite as sweet smelling, while the heavy glossy foliage is attractive throughout the season.

FARMERS' INSTITUTE WORK.

During the year a number of addresses have been given at Institute meetings at various points in Manitoba and at several places in Alberta. In January and February the Alberta Department of Agriculture and the Dominion Department of Agriculture co-operated in sending a travelling grain-judging school through the province. The meetings were held in railway cars, one day being spent at each point. The subjects discussed included such topics as: 'The varieties and milling qualities of oats and wheat,' 'The commercial grading of grain,' 'The treatment of grain for smut prevention,' 'The eradication of weeds.' During the first two weeks of January, I attended as one of the lecturers and addressed meetings at ten points in Southern Alberta. The meetings were well attended and great interest was manifested throughout.

A number of seed fairs were attended, as follows:—

Carberry, January 29.
Portage la Prairie, January 31.
Killarney, February 5.
Winnipeg, February 17-18.
Brandon, March 10-13.

At these meetings I acted as judge of the grain and gave an address at the meeting afterwards.

Institute meetings were also addressed at the following places: Oak Lake, February 12; Harding, March 4; and Oak River, March 4.

DISTRIBUTION OF GRAIN, POTATOES, &c.

Grain of all kinds, in 3-pound bags	162
Seedling trees and shrubs, packages	452
Potatoes in 3-pound bags	110
Maple seed, packages	3
Rhubarb seed, packages	3

EXHIBITION MATERIAL.

During the summer and autumn months sixteen large cases of grains and grasses were prepared and forwarded to the Exhibition Branch of the Department of Agriculture for use at foreign exhibitions.

An exhibit of grain and grasses and vegetables was made at the Brandon Summer Fair, and a display of vegetables and fruits at the exhibition of the Brandon Horticultural Society in August. A small exhibit was also made at the Winter Fair held in Brandon in March.

METEOROLOGICAL TABLES FOR BRANDON, MAN.

Months.	Highest Temperature.		Lowest Temperature.		Total Rainfall.	Total Snowfall.	Hours bright Sunshine.
1907.	Day.	Deg.	Day.	Deg.	Inches.	Inches.	Hours.
April	22	48·1	5	4·2	....	10½	172·8
May	31	72·6	10	9·5	2·65	....	210·9
June	15	86	5	28·5	2·51	....	178·8
July	20	85	1	38	1·73	....	263·5
August	9	92	3	32·5	6·24	....	206·9
September	17	78	25	22·5	·82	....	162·5
October	5	78	18	6	·20	....	174
November	6	55·7	29	—14·2	....	3½	96·9
December	6	39	25	—22·7	....	2	66·7
1908.							
January	20	39·9	29	—46·4	....	3	123·8
February	24	45·9	1	—31·3	·05	7½	116·7
March	22	46·9	8	—31·3	....	14	134·9
					14·20	40½	1,908·4

CORRESPONDENCE.

This year 3,931 letters were received and 3,263 dispatched, irrespective of circulars sent out.

I have the honour to be, sir,
Your obedient servant,

JAMES MURRAY,
Superintendent.

EXPERIMENTAL FARM FOR SASKATCHEWAN

REPORT OF MR. ANGUS MACKAY, SUPERINTENDENT.

EXPERIMENTAL FARM, INDIAN HEAD, SASK.,
March 31, 1908.

Dr. WM. SAUNDERS, C.M.G.,
Director, Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit to you my twentieth annual report of the work done on the Experimenal Farm for the Province of Saskatchewan, at Indian Head, Sask., for the year ending March 31, 1908.

The past season without an exception was the most unfavourable for grain crops of all sorts throughout the province since the Farm was started twenty years ago. The winter of 1906-07 was the coldest and longest in the history of the west since settled in 1882.

Usually seeding is well advanced if not completed in April. Last year it started in a few places early in May, but did not become general until the 10th or 12th of the month, and in some places not until the 15th to 20th.

The weather in June and July was favourable for growth, but all crops were from three to four weeks later than ever known before, and with a wet August and cold September, the grain was long in maturing, and frost overtook the greater portion before it was ready to cut causing a very serious loss throughout the province. In a few localities where want of sufficient rain in June caused a short crop of straw, a part of the wheat crop was well advanced when the frost came, and with the high price for the grain the settlers were fairly successful.

On the Experimental Farm the late, unfavourable season caused a small yield of wheat both in field and uniform test plots, as well as injuring the quality greatly.

In oats, barley and peas the yields were very satisfactory, but all the varieties in oats and peas were not matured when frost came, and these were more or less injured in vitality.

The root crop on the whole was good considering the season.

Trees and shrubs made a rapid growth, notwithstanding the long, cold winter of 1906-7.

Seeding started on May 2 and was completed on May 20. Harvest commenced on August 22 with fall rye, on 23rd with barley, on September 9 with oats and on 17th with wheat.

FROSTS.

On the nights of 1st and 20th August the thermometer registered 35° and 33° respectively, and in some districts frost caught the wheat when forming and stopped further growth. No doubt the temperature at these points was several degrees lower than on the Experimental Farm. On 12th September two degrees of frost were recorded, corn and tender vines were touched, but potatoes were not injured. On 21st September a killing frost visited every district and nothing escaped.

EXPERIMENTS WITH SPRING WHEATS.

TEST OF VARITIES.

Eighteen varieties of spring wheat were sown on May 6 on fallowed land clay loam at the rate of 1½ bushels of seed per acre. No more promising stand of all varieties was ever grown on the Farm; rust however struck them after heading, and with the cold, wet weather and frost the yields were greatly reduced, and the sample was very poor.

WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Cutting.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Marquis B...........	Sept. 18	135	46	Weak	2¾	Bald	5,340	32	..	55½	Badly.
2	Colorado	" 18	135	50	"	2¾	Bearded..	5,080	25	20	51½	Consid'ably.
3	Preston A	" 13	130	48	Strong....	3¼	" ..	5,200	23	20	51½	Badly.
4	Bishop..............	" 13	130	46	Medium..	3	Bald	4,360	23	20	52	"
5	Pringle's Champlain .	" 18	135	47	" ..	3	Bearded..	5,040	23	..	51	Consid'ably.
6	Percy A	" 13	130	52	Strong....	3¼	Bald	4,840	21	40	52¾	Badly.
7	Huron..............	" 13	130	51	"	3¼	Bearded..	5,060	21	..	51½	"
8	Stanley A...........	" 15	132	49	"	3¼	Bald	5,140	19	40	51	"
9	Chelsea..............	" 15	132	46	Weak	3	"	4,300	19	20	51½	"
10	Herisson Bearded....	" 20	137	40	Medium..	2	Bearded..	5,080	19	..	49	"
11	Riga	" 10	127	48	Strong....	2½	Bald	4,660	17	40	53	"
12	White Fife	" 20	137	50	"	3½	"	4,860	17	20	49½	"
13	Red Fern	" 18	135	51	"	3½	Bearded..	5,200	15	40	48	"
14	White Russian......	" 15	132	47	Medium..	3¼	Bald	4,700	15	20	50	"
15	Gatineau	" 20	137	48	Weak ...	3¼	Bearded..	5,140	14	40	49½	"
16	Hungarian White....	" 18	135	49	Strong....	3	" ..	4,500	13	20	46	"
17	Bobs.........	" 10	127	46	Medium..	2½	Bald	4,000	12	40	44	Very badly.
18	Red Fife H.	" 18	135	46	Strong....	3¼	"	5,060	12	..	55	Badly.

DURUM OR MACARONI WHEATS.

Five varieties were sown in uniform plots on May 7 of one-twentieth acre, on fallowed land, clay loam, at the rate of 1½ bushels of seed per acre. Though sown only one day later than the other wheat plots, they all suffered more from frost and are useless for seed owing to very low germinating power.

MACARONI WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.	Rusted.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.	
1	Goose..........	Sept. 18.	134	50	Weak	2¼	Bearded. .	4,560	31	40	51	Slightly.
2	Roumanian...........	" 18.	134	55	"	2½	" ..	5,300	31	..	51	"
3	Yellow Gharnovka...	" 20.	136	55	"	2¼	" ..	5,040	29	20	51	"
4	Mahmoudi............	" 19.	135	48	"	2¼	" ..	4,460	25	40	49	"
5	Kubanka.............	" 20.	136	58	"	2½	" ..	5,100	25	20	53	Consid'ably

FIELD LOTS OF SPRING WHEAT.

Seven varieties were sown in field lots on fallowed land, 1½ bushels of seed being sown per acre. Red Fife seeding was started on the afternoon of May 2. Frost at nights made it impossible to do any work on the land during the forenoons up to the 14th of the month.

All varieties gave a heavy crop of straw, with no lodging except in low places.

Red and White Fife were badly frozen and are unfit for seed; Preston and Huron were cut on September 17, or three days before frost came, but low spots were green, and the grain was injured in the stook. Stanley, Percy and Pringle's Champlain were cut after the frost and greatly injured.

The dates are given when the grain was cut, as no variety was fully matured when the frost came. It is safe to say that with the weather then prevalent, 10 days more for Red and White Fife, and 3 to 5 days for the other sorts were required to ripen them.

In addition to the above, 7 sorts on fallow, 4 varieties were sown on land that had a crop of peas the preceding year.

Wheat in Field Lots.

Name of Variety.	No. of Acres.	Date of Sowing.	Date of Cutting.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per measured bushel after cleaning.
	Acres.				In.		In.		Bush.	Lbs.	Lbs.
Huron	2½	May 6	Sept. 17	134	48	Strong	3¼	Bearded	32	37	61
Pringle's Champlain	6¾	" 4	" 23	142	48	"	3½	"	29	53	58½
Preston	5¾	" 3	" 17	137	50	"	3¼	"	29	48	62
Stanley	5	" 3	" 21	141	52	"	3½	Bald	29	10	57½
Percy	3	" 4	" 21	140	49	"	3¼	"	23	45	57
White Fife	5	" 4	" 23	142	41	"	3	"	19	13	52
Red Fife	25	" 2	" 23	144	47	"	3	"	18	..	54
On Pea Land.											
Marquis B	⅕	" 8	" 15	130	48	Strong	3	Bald	41	40	58½
Percy A	⅙	" 8	" 16	131	55	"	4	"	35	50	59¼
Chelsea	⅓	" 8	" 14	129	53	Weak	3	"	34	5	57
Red Fife H	⅖	" 8	" 24	139	50	Strong	3¼	"	30	22	55

Spring Wheat—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Huron	Fallow	2½	32	37	81	32
Pringle's Champlain	"	6¾	29	53	201	43
Preston	"	5¾	29	48	171	31
Stanley	"	5	29	10	145	50
Percy	"	3	23	45	71	15
White Fife	"	5	19	13	96	5
Red Fife	"	25	18	..	450	..
		53			1,215	56

An average of 22 bushels, 57 pounds per acre.

SPRING WHEAT—FIVE YEARS COMPARISON OF FIELD LOTS.

The average yield per acre and time taken to mature of five varieties grown in field lots under similar conditions for the past five years, are given below.

Variety.	Average Days to Mature.	Days earlier than Red Fife.	Average Yield per Acre.	
			Bush.	Lbs.
Huron	130·2	12·2	39	24
Preston	132	10·4	38	12
Red Fife	142·4	....	32	24
Stanley	132·8	9·6	32	12
Percy	133·6	8·8	28	38

FALL WHEAT.

Two acres of fallowed land were sown with Alberta Red fall wheat in the fall of 1906; $\frac{3}{4}$-acre on August 8, $\frac{3}{4}$-acre on September 7, and $\frac{1}{2}$-acre on September 18.

The different seedings came up well, the first two covering the ground fairly well, and the last showing in the rows.

Except where the first and second seedings were under the shelter of a hedge, or in low spots, the wheat in these plots was killed, while the third seeding was not injured to any extent. The wheat was ripe and cut on September 5. The straw was 45 inches long, and rather weak. Heads $2\frac{1}{2}$ inches long.

The yield on the $\frac{1}{2}$-acre was 14 bushels, 35 pounds, or at rate of 29 bushels, 10 pounds to the acre.

On the sheltered spots of No. 1 and No. 2 seedings, which were irregular, 10 bushels were threshed.

SUMMER FALLOWS.

In view of the great importance of properly preparing land for crops, and of the large number of new settlers coming into the country, I make no excuse for repeating what was said in my last three reports respecting summer-fallows, and breaking up and cultivating new prairie land.

It is very gratifying to know that throughout the Northwest, summer-fallowing is rapidly becoming general. No matter where farming is carried on, the farmers realize that to be sure of a crop they must prepare a portion of their land the year before the crop is grown, and apart from the value of the stored moisture, there is the inestimable advantage of keeping weeds from overrunning the farm.

The true worth of properly prepared fallows has been clearly demonstrated in past years in every grain-growing district of Saskatchewan.

The work of preparing land for crop by fallowing is carried on in so many ways in different parts of the Northwest, that perhaps a few words on some of the methods employed may be of help to at least some of the new settlers.

It has been observed in Alberta and Saskatchewan that the land to be fallowed is not, as a rule, touched until the weeds are full grown and in many cases, bearing fully matured seed. It is then ploughed.

By this method, which, no doubt, saves work at the time, the very object of a summer-fallow is defeated. In the first place, moisture is not conserved because the land has been pumped dry by the heavy growth of weeds; and, secondly, instead of using the summer-fallow as a means of eradicating weeds, a foundation is laid for years of labour and expense by the myriads of foul seeds turned under.

The endless fields of yellow-flowered weeds, generally Ball Mustard (*Neslia paniculata*), testify to the indifferent work done in many districts, and, while no weed is

Western Rye Grass (*Agropyrum tenerum*) grown for seed at Experimental Farm, Indian Head, Sask. Photo by C. E. Saunders.

more easily eradicated by a good system of fallows, there is no weed that is more easily propagated or takes greater advantage of poor work on fallows or of fall or spring cultivation.

As has been pointed out in my previous reports, early and thorough work on fallows is absolutely necessary to success, and I here repeat the methods and results of tests carried on for some years past.

First Method.—Ploughed deep (6 to 8 inches) before last of June; surface cultivated during the growing season, and just before or immediately after harvest ploughed 5 or 6 inches deep.

Result.—Too much late growth if season was at all wet; grain late in ripening, and a large crop of weeds if the grain was in any way injured by winds.

Second Method.—Ploughed shallow (3 inches deep) before the last of June; surface cultivated during the growing season, and ploughed shallow (3 to 4 inches deep) in the autumn.

Result.—Poor crop in a dry year; medium crop in a wet year. Not sufficiently stirred to enable soil to retain the moisture.

Third Method.—Ploughed shallow (3 inches) before the last of June; surface cultivated during the growing season, and ploughed deep (7 to 8 inches) in the autumn.

Result.—Soil too lose and does not retain moisture. Crop light and weedy in a dry year.

Fourth Method.—Ploughed deep (7 to 8 inches) before the last of June; surface cultivated during the growing season.

Result.—Sufficient moisture conserved for a dry year, and not too much for a wet one. Few or no weeds, as all the seeds near the surface have germinated and been killed. Surface soil apt to blow more readily than when either of the other methods is followed. For the past fourteen years, the best, safest and cleanest grain has been grown on fallow worked in this way, and the method is therfore recommended.

Fallows that have been ploughed for the first time after the first of July, and especially after July 15, have never given good results; and the plan too frequently followed of waiting till weeds are full grown, and often ripe, and ploughing under with the idea of enriching the soil, is a method that cannot be too earnestly advised against.

In the first place, after the rains are over in June or early in July, as they usually are, no amount of work, whether deep or shallow ploughing, or surface cultivation, can put moisture in the soil. The rain must fall on the first ploughing and be conserved by surface cultivation.

Weeds, when allowed to attain their full growth, take from the soil all the moisture put there by the June rains, and ploughing under weeds with their seeds ripe or nearly so, is adding a thousand-fold to the myriads already in the soil, and does not materially enrich the land.

METHODS OF PREPARING NEW GROUND.

In view of the fact that every year brings to the Northwest many new settlers who are unacquainted with the methods of breaking up and preparing new land for crop, a few suggestions with regard to this very important work may not be amiss.

In all sections where the sod is thick and tough, breaking and back-setting should be done; while in districts where scrub abounds and the sod is thin, deep breaking is all that is necessary.

The former is generally applicable to the southern parts of Saskatchewan.

SHALLOW-BREAKING AND BACK-SETTING.

The sod should be turned over as thin as possible, and for this purpose a walking plough with a 12 or 14-inch share, is the best. When the breaking is completed (which should not be later than the second week in July, rolling will hasten the rotting process and permit back-setting to commence early in August.

Back-setting is merely turning the sod back to its original place, and at the same time bringing up two or three inches of fresh soil to cover it. The ploughing should be done in the same direction as the breaking and the same width of furrow turned. Two inches below the breaking is considered deep enough, but three to four inches will give better results.

After back-setting, the soil cannot be made too fine, and the use of disc or Randall harrow to cut up every piece of unrotted sod, will complete the work.

DEEP BREAKING.

Deep breaking, which in many sections of the country is the only practicable way of preparing new land, and which is, unfortunately, done in some instances where breaking and back-setting would give more satisfactory results, consists in the turning over of the sod as deeply as possible, usually from four to five inches.

When the sod has rotted, the top soil should be worked and made as fine as possible. The use of harrow and disc will fill up all irregularities on the surface, and make a fine, even seed-bed.

Whether the land is broken shallow or deep, it is necessary to have the work completed early, so as to take advantage of the rains which usually come during June or early in July. These rains cause the sod to rot, and without them, or if the ploughing is done after they are over, the sod remains in the same condition as when turned, and no amount of work will make up for the loss.

WORKING LAND AFTER FIRST CROP.

Inquiries are often made as to what should be done after taking off the first crop on new land, the question being as to whether the land should be ploughed, or cultivated, or sown without any cultivation whatever.

This, however, can only be determined by circumstances. In districts with heavy clay soil, a satisfactory crop may be expected from burning the stubble of the former crop and sowing with or without cultivation, although a shallow cultivation after the stubble is burnt usually gives the best results.

In districts with light soils and especially with gravelly subsoil, cultivation before seeding is necessary.

After taking the second crop from breaking or back-setting, there can be no doubt that the land should be well fallowed to put it in proper condition for succeeding crops. If the fallow is well made and the process repeated every third year, the settler will have started on the right road to future success.

Emmer and Spelt—Test of Varieties.

Two varieties of Emmer and two of Spelt were sown on fallow on one-twentieth acre plots. Soil, clay loam. One-half acre of Common Emmer was also sown on root land.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.
					In.		In.		Lbs.	Lbs.
1	Red Spelt	May 13	Sept. 19	129	48	Strong	4	Bald	6,160	2,200
2	Common Emmer	" 13	" 20	130	44	Weak	2½	Bearded	6,240	2,020
3	White Spelt	" 13	" 19	129	47	Strong	5	Bald	6,460	1,560
4	Red Emmer	" 13	" 20	130	45	Medium	2¾	Bearded	6,700	1,320
5	Common Emmer	" 20	" 20	123	43	Strong	2	"	....	1,830

EXPERIMENTS WITH OATS.

TEST OF VARIETIES.

Thirty-one varieties were sown on fallowed land on plots of one-twentieth acre each, on May 14. Soil, clay loam. All the varieties were exceedingly heavy in straw, and nearly all varieties gave large yields. Some of the sorts were more or less injured in germination, Tartar King, Storm King, Golden Giant, Goldfinder and Kendal Black being greatly injured. There was no rust on any of the varieties.

Oats—Test of Varieties.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weigth per Measured Bushel after Cleaning.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Sensation	Sept. 25	134	54	Medium	8	Branching	5,140	127	32	38
2	Columbus	" 15	124	55	Weak	9	"	4,420	127	22	36½
3	Swedish Select	" 20	129	56	"	8	"	4,000	127	22	39¼
4	Danish Island	" 13	122	57	Medium	8	"	4,600	123	8	40
5	Banner	" 18	127	54	"	9	"	4,960	122	32	39
6	Improved Ligowo	" 15	124	50	Weak	8	"	4,720	122	2	39½
7	Golden Beauty	" 15	124	52	"	7	"	4,800	121	6	38½
8	Irish Victor	" 21	130	55	Medium	9	"	5,300	119	14	39¾
9	Bavarian	" 18	127	52	Weak	7	"	4,100	117	22	39½
10	Improved American	" 23	132	51	"	9	"	5,260	117	2	38¼
11	Kendal White	" 23	132	54	"	9	"	4,760	116	16	35
12	Thousand Dollar	" 20	129	52	Medium	8	"	5,080	115	30	38½
13	Twentieth Century	" 20	129	53	"	8	"	5,200	115	..	38
14	Goldfinder	" 25	134	50	Weak	8	"	5,200	112	32	35
15	Golden Fleece	" 15	124	52	Medium	8	"	4,800	112	12	39½
16	Virginia White	" 18	127	50	Weak	9	"	5,160	110	20	37½
17	Siberian	" 23	132	55	Medium	8	"	5,000	108	28	34½
18	Tartar King	" 23	132	62	Strong	9	Sided	5,140	108	18	40½
19	Lincoln	" 21	130	55	Weak	8	Branching	5,480	106	16	35¼
20	American Triumph	" 18	127	54	"	8	"	4,720	105	20	39
21	Golden Giant	" 25	134	58	Strong	9	Sided	4,380	105	10	36
22	White Giant	" 18	127	55	Medium	8	Branching	5,300	104	4	37
23	Pioneer	" 26	135	57	Strong	8	"	5,400	103	18	40
24	American Beauty	" 13	122	50	Medium	8	"	4,800	103	18	41
25	Abundance	" 18	127	53	"	9	"	4,100	102	12	40
26	Wide Awake	" 16	125	58	"	9	"	5,160	101	16	38½
27	Milford White	" 24	133	54	"	8	Sided	5,160	98	8	38
28	Joanette	" 23	132	57	"	8	Branching	4,260	93	8	35
29	Black Beauty	" 19	128	54	"	8	"	5,600	92	32	36½
30	Storm King	" 23	132	65	Strong	10	Sided	4,580	88	8	40½
31	Kendal Black	" 23	132	62	"	10	"	5,480	82	12	36

OATS—FIELD LOTS.

Nine varieties were sown in field lots on fallowed land, two bushels of seed being sown per acre. The crop of straw of all sorts was very heavy and badly lodged in places, Thousand Dollar and Black Beauty being the worst in this respect, and having to be cut one way.

Banner for the first time had to give way to other sorts in yield. Goldfinder was quite green when frost came and the crop was cut for feed, not being considered of any use for seed.

Oats in Field Lots.

Name of Variety.	No. of Acres.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
	Acres.				In.		In.		Bush.	Lbs.	Lbs.
Thousand Dollar...... ..	4¼	May 11.	Sept. 20.	132	50	Weak ..	8	Branching	95	..	43¾
Danish Island..........	3½	" 10.	" 14.	127	48	Medium	8	" .	92	12	39½
White Giant.....	4¾	" 8.	" 10.	125	46	Strong .	7	" .	91	20	43¼
Wide Awake...........	5	" 9.	" 18.	132	50	Medium	8	" .	89	30	40¼
Banner	21¼	" 10.	" 16.	129	54	Strong .	9	" .	72	30	42
Black Beauty.........	1¾	" 13.	" 14.	124	40	Weak ..	8	" .	72	12	38
Improved Ligowo.....	2¾	" 10.	" 18.	131	50	Strong .	8	" .	69	13	43
Tartar King..	2¼	" 9.	" 20.	134	43	" .	8	Sided....	69	10	44
Goldfinder.......... ...	3¼	" 13.	" *25.	135	54	" .	9	Branching	Cut for feed.		

* Date when cut, unmatured

Oats.—Average and Total Yields.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	lbs.	Bush.	lbs.
Thousand Dollar............................	Fallow	4¼	95	..	403	25
Danish Island	"	3½	92	12	323	8
White Giant................................	"	4¾	91	20	435	..
Wide Awake	"	5	89	30	449	..
Banner	"	21¼	72	30	1,548	25
Black Beauty..........	"	1¾	72	12	126	21
Improved Ligowo.........................	"	2¾	69	13	190	27
Tartar King..	"	2¼	69	10	155	31
Totals	....	45½	....		3,629	15

An average of 79 bushels, 16 pounds per acre.

OATS—FIVE YEARS COMPARISON OF FIELD LOTS.

The average yield per acre and time taken to mature of six varieties of oats grown in field lots under similar conditions for the past five years are shown below.

Variety.	Average Days to Mature.	Average Yield per Acre.	
		Bush.	lbs.
Banner.......................................	119·2	94	18
Wide Awake.................................	119·6	88	24
Black Beauty...............................	117	84	..
Thousand Dollar...........................	117·8	82	15
Tartar King.................................	116·8	76	30
Improved Ligowo..........................	118·4	76	17

EXPERIMENTS WITH BARLEY.

Fifteen varieties of six-rowed and thirteen varieties of two-rowed barley were sown on clay loam, one-twentieth acre plots of fallowed land, on May 14, at the rate of two bushels of seed per acre. All sorts were heavy and lodged badly, one-third of the plots having to be cut with the mower one way. All the varieties ripened and were in stook long before frost came. The yield was large, but the sample was coloured with dew and rains.

BARLEY, SIX-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Blue Longhead	Aug. 26	105	46	Weak	2½	5,760	86	2	45½
2	Mansfield	" 27	106	46	"	2½	4,380	72	14	50¼
3	Oderbruch	" 29	108	46	"	2½	3,800	68	26	51
4	Yale	Sept. 3	113	45	Medium	3	3,500	67	4	50½
5	Empire	Aug. 27	106	50	"	2¾	4,420	66	22	51½
6	Argyle	" 25	104	53	"	2½	5,220	65	30	48½
7	Claude	" 29	108	48	Weak	3	4,060	65	30	50
8	Mensury	" 29	108	53	Medium	3½	4,220	61	12	49½
9	Trooper	" 31	110	47	"	2¾	3,860	58	46	51
10	Nugent	" 29	108	50	"	3¼	4,180	55	30	49
11	Stella	" 30	109	50	Weak	3	4,380	52	4	51
12	Albert	" 27	106	47	"	3	4,820	51	12	51½
13	Champion	" 24	103	47	"	3	4,200	47	24	43½
14	Summit	" 31	110	45	"	3	4,120	42	44	48
15	Odessa	Sept. 2	112	40	Medium	2¼	3,460	41	32	48½

BARLEY, TWO-ROWED—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Jarvis	Sept. 3	111	57	Medium	4	4,400	61	2	52¼
2	Standwell	" 3	111	42	Strong	3½	4,720	59	8	51
3	Danish Chevalier	" 8	116	44	Weak	4½	4,620	58	16	47
4	Logan	" 1	109	53	Medium	3½	3,910	56	12	52¾
5	Swedish Chevalier	" 8	116	40	Weak	4¼	4,240	54	28	49½
6	Gordon	" 4	112	51	"	3	4,780	54	28	50
7	Invincible	" 8	116	40	"	3	4,080	54	28	49¼
8	Clifford	" 3	111	52	Medium	2¾	4,820	53	36	51½
9	Canadian Thorpe	" 4	112	50	Strong	3	4,520	51	32	50
10	Sidney	Aug. 28	105	48	Medium	4	4,740	50	30	52½
11	Beaver	Sept. 8	116	46	"	3	3,980	48	16	51
12	Dunham	" 5	113	43	"	3½	5,080	48	16	50
13	French Chevalier	" 8	116	45	Weak	4	4,740	36	12	45

BARLEY—FIELD LOTS.

Eight sorts were sown in field lots on clay loam. Two of these on land that had peas the preceding year, the land being ploughed 6 inches deep in the fall, and cultivated in the spring. Five sorts were sown on land previously occupied by the forestry farm for tree growing. The land was ploughed in the fall and cultivated in the spring. One variety was sown on fallowed land, cultivated in the spring.

The six-rowed sorts were all in stook in August, and the two-rowed in the first week in September. Odessa was badly lodged and had to be cut one way with mower. All the two-rowed sorts had to be cut one way with the binder.

BARLEY IN FIELD LOTS.

Name of Variety.	Size of Lot.	Date of Sowing.	Date of Ripening.	Number of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
	Acres.				In.		In.		Bush.	Lbs.	Lbs.
Mansfield	3	May 16	Aug. 27	103	53	Strong	$2\frac{1}{4}$	6-rowed	59	22	$51\frac{1}{2}$
Odessa	$2\frac{1}{4}$	" 16	" 28	104	42	Medium	$2\frac{1}{4}$	"	55	5	$49\frac{1}{2}$
Mensury	$7\frac{1}{4}$	" 14	" 29	107	48	Strong	3	"	49	30	$50\frac{3}{4}$
Claude	2	" 16	" 27	103	50	"	2	"	48	6	$52\frac{1}{4}$
Canadian Thorpe	$3\frac{1}{2}$	" 16	Sept. 5	112	35	"	3	2-rowed	48	..	51
Invincible	$2\frac{1}{4}$	" 15	" 4	112	34	"	3	"	45	44	51
Sidney	$2\frac{1}{4}$	" 15	" 3	111	45	Medium	$3\frac{3}{4}$	"	43	32	$53\frac{1}{4}$
Standwell	$2\frac{1}{2}$	" 15	" 4	112	48	Strong	$3\frac{1}{2}$	"	36	32	$50\frac{3}{4}$

BARLEY—AVERAGE AND TOTAL YIELD.

Variety.	Cultivation.	Acres.	Yield per Acre.		Total Yield.	
			Bush.	Lbs.	Bush.	Lbs.
Mansfield	After peas	3	59	22	178	18
Odessa	" trees	$2\frac{1}{4}$	55	5	124	..
Mensury	" fallow	$7\frac{1}{4}$	49	30	359	38
Claude	" peas	2	48	6	96	12
Canadian T[illegible]	" trees	$3\frac{1}{2}$	48	..	168	..
Invincible	" "	$2\frac{1}{4}$	45	44	103	6
Sidney	" "	$2\frac{1}{4}$	43	22	97	38
Standwell	" "	$2\frac{1}{2}$	36	32	91	32
		25			1,219	00

An average of 48 bushels 36 pounds per acre.

BARLEY.—FIVE YEARS' COMPARISON OF FIELD LOTS.

The average yield per acre and time taken to mature of eight varieties of barley grown in field lots for the past five years, are given below.

Variety.	Average days to Mature.	Average Yield per Acre.	
		Bush.	Lbs.
Claude	106·6	59	35
Odessa	103·2	58	4
Mansfield	105·6	56	31
Mensury	103·2	53	21
Invincible	113·2	48	16
Sidney	107·4	44	37
Standwell	111	44	10
Canadian Thorpe	107·8	41	19

ROTATION TESTS.

These tests were commenced in 1899. Each plot is one-half acre in size, the soil being clay loam.

The preparation of the land for the tests was as follows: All the half-acres required that had grain the previous year (1906) were ploughed 6 inches deep and harrowed, as soon as the crop was threshed. The half-acres on which peas, tares and clovers were sown were ploughed 6 to 7 inches deep and harrowed as soon as the various crops were ready—the peas and tares as soon as the pods were forming, the clovers when the growth had stopped and before frost killed the tops.

The plots were all cultivated before seeding and harrowed afterwards.

The order of rotation of each plot is given below.

Number.	1905.	1906.	1907.
1	Wheat	Oats	Peas.
2	Wheat	Wheat	Tares.
3	Wheat	Oats	Alsike.
4	Wheat	Wheat	Red Clover.
5	Wheat	Barley	Alfalfa.
6	Peas	Wheat	Wheat.
7	Tares	Wheat	Oats.
8	Soja Beans	Wheat	Oats.
9	Red Clover	Wheat	Wheat.
10	Alsike and Alfalfa	Wheat	Barley.
11	Timothy	Wheat	Fallow.
12	Wheat	Wheat	Fallow.
13	Wheat	Oats	Fallow.
14	Wheat	Barley	Fallow.
15	Wheat	Wheat	Oats.
16	Wheat	Barley	Oats.
17	Oats	Alsike	Wheat.
18	Wheat	Peas	Wheat.
19	Oats	Tares	Wheat.
20	Wheat	Red Clover	Wheat.
21	Barley	Alfalfa	Wheat.
22	Common Emmer	Summer fallow	Wheat.

ROTATION TEST—SEASON 1907.

Number.	Name of Variety.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Yield per Acre.	
					In.		In.	Bush.	Lbs.
1	Peas	May 20	*	....	...	....	..	...	....
2	Tares	" 20	*	....	....	....	....	...	....
3	Alsike	June 5	†	...	....	....	....	...	....
4	Red Clover	" 5	†	....	....	....	....	...	....
5	Alfalfa	" 5	†	...	...	....	...	...	....
6	Wheat	May 8	Sept. 24	139	48	Strong	3	17	34
7	Oats	" 14	" 9	118	42	"	8	62	6
8	"	" 14	" 9	118	42	"	8	53	9
9	Wheat	" 8	" 24	139	45	"	2¾	16	22
10	Barley	" 14	" 5	114	36	"	2	26	..
11	Fallow	...	....	....	....	....	...	...	....
12	"	....	....	....	....	....	....	...	....
13	"	....	....	....	...	....	....	...	....
14	"	....	....	....	....	....	....	...	....
15	Oats	May 14	Sept. 9	118	43	Strong	8	52	12
16	"	" 14	" 9	118	45	"	8	61	26
17	Wheat, Red Fife	" 8	" 24	139	49	"	2¾	18	10
18	" "	" 8	" 24	139	50	"	3	15	56
19	" "	" 8	" 24	139	47	"	3	12	56
20	" "	" 8	" 24	139	46	"	3	23	18
21	" "	" 8	" 24	139	45	"	3	12	24
22	" "	" 8	" 24	139	46	"	3	23	6

* Plowed under, August 8. † Plowed under, September 5.

TEST OF LATE SOWN GRAIN.

Variety.	Date Sown.	Date Cut.	Days from Sowing to Cutting.	Length of Straw.	Character Straw.	Length of Head.	Yield per Acre.		Germination.	Weight per Measured Bushel.	Remarks.
				In.		In.	Bush.	Lbs.	p. c.	Lbs.	
Red Fife wheat	May 30.	Sept. 26.	119	50	Strong	3½	18	40	12	38¼	Unsaleable.
Preston wheat	" 30.	" 26.	119	52	Medium	3½	22	20	25	37	"
" "	June 7.	" 26.	111	52	Strong	3½	18	20	16	36½	"
Banner oats	May 30.	" 26.	119	55	Weak	8	56	..	33	34	
" "	June 7.	" 26.	111	55	"	8	26	16	29	32½	
Mensury barley	May 30.	" 26.	119	48	Medium	3	21	12	..	..	
" "	June 7.	" 26.	111	48	"	3	29	28	..	..	

SMUT TESTS.

Last year, on request of Mr. Geo. H. Clark, Dominion Seed Commissioner, a test was undertaken to determine whether smut dust sown on the land would cause smut in the grain.

A two-bushel bag of smut dust was obtained from the Fort William Smut-cleaning elevator. This was sown by hand on five plots, each 8 feet square, with 3-foot divisions, the dust being well worked into the soil before the grain was sown.

On three plots No. 1 Northern seed (Red Fife) was sown; on the other two plots small and shrunken seed was used.

A similar series of plots were prepared and sown, but no smut was sown on these.

The treatment of seed and results obtained were as follows:—

No.	Seed.	Treatment.	Smut Heads.
		Smut Dust Plots.	
1.	Red Fife, good seed	1 lb. Formalin to 30 gallons water	52
2.	" " "	1 lb. Bluestone to 10 " "	44
3.	" " "	Untreated	81
4.	" small seed	1 lb. Formalin to 30 gallons water	36
5.	" " "	1 lb. Bluestone to 10 " "	89
		Plots with no Smut Dust.	
1.	Red Fife, good seed	1 lb. Formalin to 30 gallons water	3
2.	" " "	1 lb. Bluestone to 10 " "	5
3.	" " "	Untreated	30
4.	" small seed	1 lb. Formalin to 30 gallons water	11
5.	" " "	1 lb. Bluestone to 10 " "	8

The results obtained go to show that smut dust when in any considerable quantity in the soil produces smut in the grain, no matter how treated.

The test between Formalin and Bluestone on all the plots show different results. In the smut dust plots it will be noticed that in the Formalin test of good grain there were more smutty heads than in the Bluestone tests, while in the poor seed the reverse was the case.

Again, in the plots where no smut dust was sown, in the Formalin test with good seed there were fewer heads of smut than from the Bluestone, while with the poor seed Bluestone has fewer heads than Formalin.

Seed treated in the same manner will be sown on the plots this year.

Tests of Formalin and Bluestone were made in plots of wheat, oats and barley at a considerable distance from the above plots, with seed dipped 20 minutes.

An eight-foot square was measured in each plot, and the smutty heads in this area counted, with the results given.

Grain.	Treatment.	Smut Heads.
Red Fife Wheat	Bluestone, 1 lb. to 10 gal. water	3
" "	Formalin, 1 " 30 "	4
" "	Untreated	8
Oats	Bluestone, 1 lb. to 10 gal. water	0
"	Formalin, 1 " 30 "	0
"	Untreated	0
Barley	Bluestone, 1 lb. to 10 gal. water	0
"	Formalin, 1 " 30 "	0
"	Untreated	0

FIELD PEAS—TEST OF VARIETIES.

Twenty varieties were sown on root land of the previous year, the soil was clay loam. This was ploughed 6 inches deep after the roots were taken up, and cultivated in the spring before seeding. The peas were sown on May 20 in plots of one-twentieth acre each at the rate of 2 to 3½ bushels of seed per acre according to the size of the peas.

All the varieties gave a large crop of straw and the yield was satisfactory, but nearly all the varieties had a few green pods when frost came, which spoilt the sample. In 5 varieties the germination was below 50 per cent.

Four varieties were sown in larger plots than in the uniform test, on the same prepared land. Green pods were among these also, and the grain was more or less injured by the frost.

PEAS.—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Character of Growth.	Length of Straw.	Length of Pod.	Size of Pea.	Yield per Acre.		Weight per bushel.
					In.	In.		Bush.	Lbs.	Lbs.
1	Chancellor	Sept. 14	117	Strong	50	2½	Small	51	40	64½
2	Early Britain	" 17	120	"	45	2	"	51	..	56½
3	Daniel O Rourke	" 18	121	"	50	2	"	49	20	64½
4	Black-Eye Marrowfat	" 20	123	"	55	3	Large	48	40	63
5	Golden Vine	" 15	118	"	40	2	Small	48	..	63½
6	Prussian Blue	" 17	120	"	58	2¼	Medium	47	40	64¾
7	Mackay	" 19	122	"	50	3	Large	47	20	60½
8	Gregory	" 21	124	"	42	2¼	Medium	45	40	63
9	English Grey	" 18	121	"	60	2¾	Large	45	..	58
10	Agnes	" 22	125	"	60	2¼	"	43	40	61
11	Paragon	" 21	124	"	48	2½	Medium	43	20	62
12	Archer	" 22	125	"	55	2¼	"	40	..	60
13	Victoria	" 17	120	"	55	2	"	39	40	63
14	Picton	" 17	120	"	52	2¾	"	38	40	63
15	Prince Albert	" 20	123	"	50	2½	Small	38	20	62
16	Nelson	" 17	120	"	45	2¾	Medium	38	20	64½
17	Prince	" 20	123	"	60	2½	Small	38	..	60
18	Wisconsin Blue	" 18	121	"	55	2¼	"	37	20	64
19	Arthur	" 16	119	"	40	2½	Large	36	..	64½
20	White Marrowfat	" 16	119	"	50	3	"	33	..	64½

EXPERIMENTS WITH MILLET.

Five varieties of Millet were sown on fallowed land on June 5. One variety failed to germinate; the others grew from 10 to 15 inches high, were injured by frost on September 12, and completely destroyed on September 21. A few heads were showing when the frost first visited the plots. No yields could be taken as it was impossible to cut them after the frost.

FALL RYE.

Fall Rye was sown on September 8, 1906, on 1½ acres of Western Rye Grass sod, broken up that spring. A very heavy crop of straw was reaped. Length of straw was 63 inches; strength medium. Heads were 4 inches long. The crop was ripe on August 22, and yielded at the rate of 36 bushels, 42 pounds of grain to the acre, in bushels of 56 pounds each.

Fall Rye never fails to give a satisfactory crop, and for early spring pasture or fodder, nothing better can be grown.

EXPERIMENTS WITH FLAX.

Name of Variety.	Character of Soil.	Date of Sowing.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Yield per Acre.		Remarks.
					In.		Bush.	Lbs.	
Yellow Seed........	Clay loam.	May 25..	Sept. 15..	113	34	Strong....	17	8	
Common..........	" .	" 25..	" 15..	113	30	Medium. .	16	44	
Riga...............	" .	" 25..	" 15..	113	31	Strong....	14	16	
Improved Russian...	" .	" 25..	" 15..	113	28	" ...	7	28	Badly killed by heavy rain.
White Flowering....	" .	" 25..	" 15..	113	26	"	3	12	" "

EXPERIMENTS WITH INDIAN CORN.

Twenty-one varieties were sown on May 29 on clay loam in drills 3 feet apart by grain drill, and in hills three feet apart each way by hand. As will be seen, the drills gave much the best yield in all the varieties.

The varieties were all cut by hand on September 23, and left on the ground until 27th or 28th, when they were drawn in, cut up, and put in the silo. The yield of green fodder being computed from the weight obtained from two rows each 66 feet long.

The frost of September 21 wilted the leaves greatly and reduced the weight of the already small crop, but did no harm to the ensilage now being used for the stock.

Three varieties were also sown at different distances apart.

Indian Corn—Test of Varieties.

Number.	Name of Variety.	Height.	Condition when Cut.	Weight per Acre grown in rows.		Weight per Acre grown in hills.	
		Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Angel of Midnight	60	Tasselled	13	1,170	11	550
2	North Dakota White........................	58	"	13	400	7	850
3	Compton's Early..............................	60	"	13	400	8	1,070
4	Giant Prolific Ensilage........................	56	Not tasselled....	12	1,850	6	650
5	Red Cob Ensilage..............................	60	"	12	1,300	4	1,920
6	Early Longfellow..............................	56	Tasselled.	12	1,300	9	920
7	Eureka..	63	Not tasselled....	12	200	10	900
8	King Philip....................................	60	Tasselled.	11	1,650	7	1,400
9	Early Leaming..................................	56	"	11	770	6	1,750
10	Salzer's All Gold..............................	55	Not tasselled. .	11	..	8	60
11	Longfellow......................................	60	Tasselled.	11	..	7	1,950
12	Wood's Northern Dent.........................	58	"	10	350	6	1,750
13	Early Butler....................................	55	Not tasselled. .	9	1,250	6	600
14	Selected Leaming..............................	64	Tasselled.	9	700	6	650
15	Cloud's Early Yellow.........................	50	Not tasselled. .	8	1,820	5	1,550
16	Mammoth Cuban	41	" ...	7	300	4	800
17	White Cap Yellow Dent	55	Tasselled.	7	300	4	800
18	Superior Fodder................................	55	Not tasselled. .	6	1,200	5	450
19	Champion White Pearl	50	Tasselled.	6	430	4	1,900
20	Pride of the North............................	54	"	5	780	5	1,000
21	Early Mastodon.................................	50	Not tasselled. .	4	1,900	6	879

INDIAN CORN—TEST OF SEEDING AT DIFFERENT DISTANCES.

Name of Variety.	Character of Soil.	Date of Sowing.	Rows, Distance Apart.	Height.	Condition when Cut.	Weight per Acre Grown in Rows.	
			Inches.	Inches.		Tons.	lbs.
Selected Leaming........	Clay loam..	May 29.....	21	45	In tassel....	13	970
"	" ..	" 29....	28	45	"	12	798
"	" ..	" 29.....	35	50	"	14	866
"	" ..	" 29.....	42	50	"	6	1,674
Longfellow.............	" ..	" 29.....	21	57	"	14	1,610
"	" ..	" 29.....	28	57	"	11	247
"	" ..	" 29.....	35	57	"	10	942
"	" ..	" 29.....	42	57	"	11	1,009
Champion White Pearl.....	" ..	" 29.....	21	50	"	7	711
" " "	" ..	" 29.....	28	50	"	6	1,462
" " "	" ..	" 29.....	35	50	"	6	1,018
" " "	" ..	" 29.....	42	50	"	4	487

HAY CROP.

WESTERN RYE GRASS.

Two acres of Western Rye sown in 1901 yielded at the rate of 2 tons, 1,000 lbs. per acre.

Twelve and one-half acres sown in 1905 gave 1 ton, 604 lbs. per acre.

A field of 4½ acres that had been manured and had grown a crop of roots in the previous year was sown with Western Rye Grass in 1906. The land was ploughed in the fall of 1905 after the roots had been taken up, and cultivated during the last week in May. Fifteen pounds of grass seed were sown to the acre. The mower was run over the field three times to keep weeds from seeding, up to the last of July, and then the grass was allowed to grow. A heavy growth resulted and was mown in the fall giving ¾ ton per acre. When cut last summer it yielded 4 tons, 308 pounds to the acre.

Two other fields were sown at the same time as the last one mentioned, with 10 lbs. Western Rye grass seed and 5 lbs. Red Clover. The crop was cut in the fall and averaged ½-ton per acre. The Red Clover in the two fields was winter-killed in places, and thinned out a good deal in the remaining portions of the fields. After taking off the crop of hay a heavy growth took place, which was allowed to remain for protection. The crop in 1907 was not heavy, but of good quality, one field of 7 acres yielding 2 tons, 360 lbs. per acre, and the other of 8¼ acres giving 1 ton, 752 lbs. to the acre. The preceding crop on both pieces was oats, the oat stubble being ploughed 4 inches deep during last week of May when the grass seed was sown.

AWNLESS BROME GRASS.

A half-acre of Brome Grass sown in 1899, and renewed by shallow ploughing in 1904, yielded 1 ton, 1,620 pounds per acre.

ALFALFA.

The various Alfalfa plots sown in 1904 and 1905, that stood and were reported on in my last report, came through safely last spring, and gave satisfactory crops. They were only cut once in 1907, the subsequent growth being left as protection.

YIELDS OF ALFALFA.

Variety.	Date Sown.	Date Cut.	Yield per Acre.	
			Tons.	lbs.
Turkestan	1904	July 22	1	1,163
Common	1904	" 22	1	1,520
"	1905	" 22	1	470
"	1905	" 22	1	1,900
Inoculated seed	1905	" 22	2	1,514
Untreated seed	1905	" 22	1	650
From the Department of Agriculture, Washington, D.C.				
Minnesota (Grimm)	1905	Sept. 23	Threshed for seed.	
New York	1905	July 22	3	..
Samarkand	1905	" 22	3	143
Nebraska	1905	" 22	2	472

ROOT CROPS.

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown on fallowed land, clay loam on which 10 loads of well rotted manure per acre was applied the previous fall. The seed was sown on May 27 and June 3, in drills 30 inches apart, on the flat. Seldom has there been a better crop either in yield or quality. As will be seen the early seeding gave the better return. Both plots were pulled on October 9. The yields of the roots were computed from the weight obtained from two rows, each 66 feet long.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Hartley's Bronze	31	832	1,047	12	20	788	679	48
2	Good Luck	28	1,288	954	48	15	1.284	521	24
3	Mammoth Clyde	27	1,440	924	..	23	1,520	792	..
4	Halewood's Bronze Top	25	1,084	851	24	17	188	569	48
5	Skirving's	25	424	840	24	20	920	682	..
6	Hall's Westbury	25	28	833	48	18	696	611	36
7	Perfection	23	1,124	785	24	19	1,072	651	12
8	Bangholm Selected	22	1,012	750	12	19	412	640	12
9	Kangaroo	21	1,956	732	36	17	1,508	591	48
10	Carter's Elephant	21	768	712	48	14	380	473	..
11	Jumbo	20	1,448	690	48	12	288	404	48
12	Magnum Bonum	20	260	671	..	15	1,812	530	12

EXPERIMENTS WITH MANGELS.

Ten varieties were sown under the same conditions as the turnips, and on the same dates. The yield was much less though the roots were of excellent quality. A very heavy rain covered the ground early in the growth of the mangels, which no doubt had a good deal to do with the small yield. The roots from both sowings were dug on September 30. The yields of the mangels were computed from the weight obtained from two rows, each 66 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Giant Yellow Intermediate	19	412	640	12	15	1,812	530	12
2	Half Sugar White	18	828	613	48	19	1,204	653	24
3	Prize Mammoth Long Red	18	36	600	36	18	300	605	..
4	Selected Yellow Globe	17	188	569	48	13	1,984	466	24
5	Crimson Champion	16	1,132	552	12	12	552	409	12
6	Mammoth Red Intermediate	16	736	545	36	12	24	400	24
7	Perfection Mammoth Long Red	16	208	536	48	13	136	435	36
8	Gate Post	14	1,040	484	..	12	1,080	418	..
9	Giant Yellow Globe	13	1,192	453	12	13	532	442	12
10	Yellow Intermediate	10	1,120	352	..	14	908	481	48

EXPERIMENTS WITH CARROTS.

Five varieties were tested. On account of the late spring the seed could not be sown in time to ensure a good crop. The carrots were sown on clay loam prepared in a similar manner to that used for turnips. The first sowing was on May 22, the second on June 3 and the roots from both were pulled on October 11. The yields of the carrots were computed from the weight obtained from two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Improved Short White	13	268	437	48	13	1,456	457	36
2	Half-long Chantenay	12	1,608	426	48	14	248	470	48
3	Ontario Champion	12	552	409	12	18	1,752	629	12
4	Giant White Vosges	6	1,992	233	12	16	472	541	12
5	White Belgian	6	1,200	220	..	8	1,688	294	48

EXPERIMENTS WITH SUGAR BEETS.

Three varieties were sown in this test, the yield in all cases being below that of 1906. The soil was clay loam, the preparation of the soil was the same as for carrots and the dates of sowing were the same. The roots were dug on October 10. The yield was computed from the weight of roots obtained from two rows, each 66 feet long.

SUGAR BEETS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Vilmorin's Improved	13	400	440	..	12	288	404	48
2	French Very Rich	11	1,364	389	24	9	348	305	48
3	Wanzleben	11	704	378	24	11	1,892	398	12

EXPERIMENTS WITH POTATOES.

Twenty-eight varieties of potatoes were planted on fallowed land clay loam which was manured the previous fall with 10 loads of rotted manure per acre. The varieties gave an even crop of tubers, with few or no small ones. While the season for potatoes on the whole was favourable, planting was delayed on account of the late spring. Heavy rains also on June 15 covered the potato ground for several days. The potatoes were all planted on May 23 and were dug September 30. The yields were computed from the weight obtained from two rows each 66 feet long.

POTATOES.—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Growth.	Average Size.	Total Yield per Acre. Bush.	Lbs.	Form and Colour.
1	Ashleaf Kidney	Strong	Large	486	12	Round, white.
2	Carman No. 1	"	Medium	466	24	" "
3	Reeve's Rose	"	"	415	48	Oval, red.
4	Burnaby Mammoth	"	Large	411	24	Long, red.
5	Everett	"	Medium	411	24	Round, red.
6	Empire State	"	Large	409	12	Long, white.
7	Vermont Gold Coin	"	"	391	36	Oval, white.
8	Uncle Sam	"	Medium	385	..	Round, white.
9	Early Envoy	"	"	378	24	Oval, red.
10	American Wonder	"	Large	371	48	Long, white.
11	Canadian Beauty	"	"	363	..	Oval, pink.
12	Early White Prize	"	Medium	360	48	Oval, white.
13	Country Gentleman	"	"	345	24	Long, pink.
14	Holborn Abundance	"	Large	336	36	Oval, white.
15	Rochester Rose	"	Medium	334	24	Round, red.
16	Vick's Extra Early	"	Large	327	48	Oval, pink.
17	Morgan's Seedling	"	"	323	24	Long, red.
18	Late Puritan	"	"	323	24	Long, white.
19	Dreer's Standard	"	"	321	12	Oval, white.
20	Sabean's Elephant	"	"	319	..	" "
21	Bovee	Medium	"	308	..	Long, pink.
22	Money Maker	Strong	Medium	308	..	Oval, white.
23	Irish Cobbler	"	Large	294	48	Round, white.
24	Early Rose	"	Medium	275	..	Oval, red.
25	State of Maine	"	Large	248	36	Oval, white.
26	Dalmeny Beauty	"	"	235	24	Round, white.
27	Maule's Thoro'bred	Medium	"	167	12	Long, red.
28	Dooley	Strong	"	149	36	Round, white.

SUMMARY OF CROPS, 1907.

	Bushels.
Wheat:	
11 varieties, 54 acres	1,249
8 half acres, rotation test	70
23 uniform test plots	24
Fall wheat	25
	1,368
Oats:	
8 varieties, 45½ acres	3,630
3 half acres, rotation test	115
31 uniform test plots	174
	3,919
Barley:	
8 varieties, 25 acres	1,219
½ acre, rotation test	13
28 uniform test plots	80
	1,312
Peas:	
2 varieties, 3¼ acres	120
20 uniform test plots	43
	163
Fall Rye	54
	Lbs.
Emmer and Spelt	1,360
	Bushels.
Potatoes	125
Roots	3,500
Corn ensilage	40
	Tons
Hay:	
Western Rye	65
Brome	1
Alfalfa	6
Cut in coulees	16
	88

EXPERIMENTS WITH VEGETABLES.

The usual tests were carried on last summer with vegetables, and with few exceptions the results were satisfactory. Frost overtook the beans before they were ripe and only 4 out of 10 sorts planted escaped fatal injury. Frost also ruined the early varieties of corn, except the Native Squaw corn. The onion crop was very poor from the late and unfavourable season. The tomatoes were also poor, having very little fruit, none of which ripened.

ASPARAGUS.

Old beds of Barr's Mammoth, Barr's Elmira and Conover's Colossal were in use from June 4 to July 25. Good crop.

BEANS—Sown May 23.

Variety.	Seed from.	In use.	Remarks.
Fame of Vitry	Seed bought from Seedsman	Aug. 6	Did not ripen
Emperor of Russia	" "	" 10	"
Extra Early	" "	" 10	Ripened Sept. 1.
White Wax	Seed grown at Indian Head	" 9	Did not ripen.
Golden Stringless	" "	" 7	Ripened Sept. 5.
Black Speckled	" "	" 10	Did not ripen.
Early Six Weeks	" "	" 7	Ripened Sept. 1.
Haricot Matchless	" "	" 10	Did not ripen.
Challenge Black Wax	" "	" 10	Ripened Sept. 1.
Haricot Extra Early	" "	" 7	Did not ripen.

BEETS—Sown May 8; taken up October 3.

Variety.	Yield per Acre.		Remarks.
	Bush.	Lbs.	
Blood Red	686	30	Extra fine beet.
Dark Red Flat Egyptian	601	48	Fine, even.
Extra Early	480	48	Early and good quality.
Nutting's Dwarf Improved	432	24	Very fine variety.
Crimson Globe	384	..	Very fine table beet.

CABBAGE—Sown in Hot-house April 6; set out May 31; takep up October 7.

Variety.	In use.	Weight per Head.	Remarks.
		Lbs.	
Early Jersey Wakefield	July 20	9	Solid and fine.
Early Paris Market	" 20	6	" "
Fottler's Drumhead	Aug. 10	17	" and very fine.
Green Globe Savoy	July 20	11	" good.
Large Flat Drumhead	....	20	" very fine.
Chester Savoy	Aug. 14	12	" good.
Vandergaw	July 25	16	" very fine.
Fottler's Improved	Aug. 8	10	Extra fine sort.
Leon Savoy	July 30	7	Solid heads.
Late Drumhead	Aug. 15	19	Extra fine.

CARROTS.—Sown May 6; taken up October 8.

Variety.	In use.	Yield per Acre.		Remarks.
		Bush.	Lbs.	
Chantenay	July 20	338	48	Small, good quality.
Half-long Danvers	" 30	326	42	" "
Oxheart	" 30	205	42	" "
French Horn	" 20	193	36	" "

CAULIFLOWER—Sown in Hot-house April 6; planted in Garden May 31.

Variety.	In use.	Remarks.
Early Snowball	July 12	Medium heads, but firm.
Early Dwarf Erfurt	" 14	" " "
Veitch's Autum Giant	Sept. 15	Late sort; large heads; very fine.
Early Paris	July 12	Medium heads, very fine.

CELERY—Sown in Hot-house April 6; set out June 8.

Variety.	Weight of Six Roots.	Remarks.
	Lbs.	
Golden Rose, self-bleaching	10	Good, solid.
Large Red-ribbed	10	" "
Paris Golden Yellow	5	Soft and poor.
Giant Pascal White	9	Good, solid.
White Plume	7	" "

CITRONS—Sown in Hot-house April 22; set out May 30.

Variety.	Yield per Hill.
	Lbs.
Colorado Mammoth	33
Colorado preserving	24

TABLE CORN—Sown May 25.

Variety.	In use.	Ripe.
Squaw, Red	August 15	September 12.
Squaw, White	" 15	" 12.
Golden Bantam		Did not ripen.
Early Premo	September 20	" "
Peep of Day	" 5	" "
Malakoff	" 15	" "
Johnson's Early	" 10	" "
Hiawatha	" 15	" "
Pocahontas	" 18	" "
Country Gentleman	Not formed	" "
Vermont Sweet	September 15	" "

CUCUMBERS—Sown April 22; set out May 30.

Variety.	In use.	Ripe.
Chicago Pickling	July 30	September 10.
Early White Spine	" 30	" 1.
Long Green Improved	" 30	" 8.
Giant Pera	" 30	" 1.

LETTUCE—Sown May 8.

Variety.	In use.	Remarks.
Cabbage	June 18 to September 15	Large crop.
Cos	July 1 to September 10	" "
Tom Thumb	July 1 to September 1	" "

MELONS.

Sown in hot-house April 22; set out May 30.
Water Melon, Cole's Early, did not mature.
Musk Melon, Paul Rose, did not mature.

ONIONS—Sown in open May 6.

Variety.	Yield per Acre.		Remarks.
	Bush.	Lbs.	
Large Red Wethersfield	84	42	Small, poor.
Extra Early Flat Red	72	36	"
Danver's Yellow Globe	60	30	"
Prize Taker			Did not germinate.
Red Wonder			"
Paris Silverskin	70	..	A good crop.

PARSLEY—Champion Moss-curled. Sown May 25; in use July 22.

PARSNIPS—Sown May 7; taken up October 9.

Variety.	Yield per Acre.	
	Bush.	Lbs.
The Student	242	..
Elcombe's Giant	193	36

PEAS.

Variety.	Sown.	In use.	Sown.	In use.	Size.
American Wonder	May 14	July 23			Medium.
Anticipation	" 14	Aug. 10			Large, fine.
Alaska	" 14	July 25			Large.
Admiral	" 14	" 20			Small.
Burpee's Profusion	" 14	Aug. 2			"
Champion of England	" 14	" 15			Medium.
Sutton's Bountiful	" 27	" 6			"
Everbearing	" 14	" 2			"
First of All	" 14	July 30			"
Horsford's Market Garden	" 14	Aug. 14			Small.
Laxton's Charmer	" 14	" 3			Medium.
Premium Gem	" 14	July 20			Small.
Rural New Yorker			May 27	Aug. 8	"
Surprise	May 14	July 20			"
Queen	" 14	Aug. 10			Very large, fine.
Sutton's Excelsior	" 14	July 27	May 27	Aug. 15	Medium.
Dwarf Telephone	" 14	" 28	" 27	" 12	Large.
Stratagem	" 14	Aug. 3	" 27		"
Shropshire Hero	" 14	" 10			Medium.
Yorkshire Hero	" 14	" 10	May 27	Aug. 15	"
Senator			" 27	" 8	"
Perfection	May 14	Aug. 1	" 27	" 15	Large.

All varieties ripened before frost came.

PUMPKINS.

Sown in hot-house April 22; set out May 30.

Sweet or Sugar, yield per hill 100 pounds. About half ripened before frost came.

RADISH.

Variety.	Sown.	In use.	Sown.	In use.	Remarks.
Olive Scarlet	May 8	June 20	June 1	July 8	Good.
Forcing	" 8	" 25	" 1	" 28	"
Early Scarlet	" 8	" 22	" 1	" 25	Extra good.
Winter, Long Spanish	" 8	Sept. 5			"

RHUBARB.

Old beds in use from June 2 to September 14.
Rhubarb seed sown May 27.

Sage.

Sown May 25; a good crop.

Spinach.

Victoria.—Sown May 25; in use July 12. Fine crop.

Squash.

Sown in hot-house April 22; set out May 30.
Long White Bush.—Yield per hill, 32 pounds.
Boston Marrow.—Yield per hill, 46 pounds.

Tomatoes.

Variety.	Sown.	Set out.	In fruit.	Yield from 14 plants.	Remarks.
Earliest of All	April 6	May 31	Aug. 6	82 lbs., green	None ripened.
Early Ruby	" 8	" 31	" 10	72 "	"
Early Jewel	" 8	" 31	" 6	47 "	"
Earlibell	" 6	" 31	" 8	43 "	"

THE FLOWER GARDEN.

The beds of annual flowers have seldom been more beautiful than last season. All varieties from the abundance of rain and not too hot weather gave a great profusion and long period of bloom. Asters, Verbenas, Stocks, Petunias and Sweet Peas were extra good.

The perennial flower beds while fairly good did not equal some of the past years. Pæonies did not bloom freely, or very long, and the early flowers, such as Tulips, Narcissus, Squills, were not equal to the previous spring's blooms.

Annuals propagated in hot-house, sown April 6-8, set out June 4-10.

Variety.	In bloom.	
	From	To
Ageratum	July 23	Sept. 26
Antirrhinum	" 9	" 25
Asters	" 4	" 27
Balsam	" 12	" 12
Bartonia	" 4	
Brachycome	" 12	" 12
Candytuft	" 8	" 15
Celosia	June 28	
Clarkia	July 22	" 20
Daisy, Shasta	Aug. 14	" 27
Daisy, double mixed	July 12	" 20
Dianthus	" 21	" 27
Gaillardia	" 12	" 12
Lobelia	" 23	" 15
Mignonette	" 9	" 20
Nasturtium	" 25	" 20
Petunia	" 24	" 20
Phlox Drummondii	" 4	" 27
Portulaca	Aug. 9	" 20
Salpiglossis	July 21	" 25
Stocks	" 4	" 27
Verbena	" 12	" 27
Zinnia	" 4	" 12

Annuals—Sown in Open, May 12 and 13.

The following annuals, sown in the open, bloomed very well, and were in most cases equal to the same varieties started in the hot-house.

Abronia umbellata,
Ageratum,
Alyssum,
Antirrhinum,
Brachycome,
Calendula,
Candytuft,
Celosia,
Centaurea,
Chrysanthemum,
Clarkia,
Cleome pungens (sown June 11),
Convolvulus,
Dianthus,
Eschscholtzia,
Gaillardia,
Godetia,
Lobelia,
Mignonette,
Nasturtium,
Nigella,
Pansy,
Phacelia,
Phlox Drummondii
Poppy,
Salpiglossis,
Scarlet Flax,
Stocks.
Sweet Peas, 36 varieties.
Tagetes.

Perennials.

Below is given the flowering period of a number of perennials, which are all grown successfully on the farm.

Name.	In bloom.	Till.
Tulips	June 5	June 18
Pansies	" 3	Oct. 15
Narcissus	" 9	June 18
Iris	" 15	July 20
Paeonia tenuifolia	" 22	" 2
Columbine	" 25	" 25
Paeonies	July 9	Aug. 9
Sweet William (biennial)	" 11	Sept. 20
Grass Pink	" 10	Aug. 10
Lychnis	" 12	Sept. 27
Clematis Recta	" 12	Aug. 18
Achillea	" 12	Sept 27
Oriental Poppy	" 9	Aug. 4
Geranium	" 12	Sept. 12
Hollyhock	" 12	" 27
Roses	" 9	" 27
Dielytra	" 9	Aug. 12
Campanula	" 16	" 28
Sidalcea candida	" 16	" 6
Lilium	" 17	" 20
Centaurea	" 17	Sept. 25
Carnations	" 21	" 27
Arctotis (biennial)	" 21	" 21
Lupinus polyphyllus	" 23	" 15
Everlasting Pea	" 23	Aug. 8
Cactus	" 23	" 8
Veronica salurgoides	" 23	Sept. 20
Helianthus	Aug. 2	" 21
Dahlias	" 2	" 12
Rudbeckia	" 20	" 20
Delphinium	" 1	" 15
Gladiolus	" 23	" 12
Cimicifuga	" 23	" 12
Sunflowers	" 25	" 27

TREES AND SHRUBS

THE ARBORETUM.

The trees and shrubs under observation came through the winter well, and made very satisfactory growth during the summer.

Last spring (1907) a large number of trees, shrubs, climbers, &c., were received from the Central Experimental Farm, Ottawa, the Experimental Station, Brookings, S.D., and from several firms of nurserymen. Following is a complete list of the varieties received:—

From Central Experimental Farm, Ottawa—

4 Acer saccharinum,
10 Abies Balsamea,
6 Berberis ilicifolia,
3 Seedlings of Hybrid Barberry,
6 Cornus Spathii aurea,
2 Cotoneaster basillaris,
1 Clethra alnifolia,
2 Euonymus alatus,
2 Euonymus Sieboldiana,
2 Hydrangea paniculata grandiflora,
2 Philadelphus coronaria aurea,
2 Pyrus Mougeoti,
2 Quercus palustre,
2 Rhamnus davuricum
2 Rhodotypus Kerrioides,
2 Rubus fasciculatum chinense,
2 Lilac, Madame Casimir Perier,
2 Lilac, Chas. Joly,
2 Lilac, Emile Lemoine,
2 Lilac, Jacques Calot,
2 Lilac, La Tour d'Auvergne,
1 Lilac, Alba Grandiflora,
2 Lilac, Congo,
2 Lilac, Souvenir de Ludwig Spath,
2 Lilac, Mdlle. Fernande Viger,
2 Syringa Pekinensis,
2 Chas. X.,
2 Michael Buchner,
60 Syringa villosa,
2 Acer pictum from Japan,
10 Acer tataricum,
2 Acer platanoïdes, purpurea,
2 Acer platanoides Schwedleri,
2 Acer tataricum, var. Aidzuense,
2 Cut-leaved Weeping Birch,
2 Clematis vitalba,
2 Clematis flammula,
2 Clematis viticella,
4 Quercus rubra,
2 Ligustrum amurense,
2 Populus aurea,
2 Picea concolor,
2 Douglas Spruce,
2 Amelanchier vulgaris,
2 Rhus cotinus,
2 Spiræa callosa superba,
2 Spiræa Anthony Waterer,
2 Rosa rugosa (double),
1 Rose, Crimson Rambler,
1 Rose, Dwarf Crimson Rambler,
1 Rose, New Rambler, 'Lady Gay.'
1 Rose, Wm. C. Egan,
1 Rose, Dorothy Perkins,
1 Rose, Alba rubrifolia,
1 Rose, Evergreen Gem,
1 Rose, Manda's Triumph,
1 Rose, Universal Favourite,
1 Rose, New Century,
1 Rose, Sir Thos. Lipton,
1 Rose, May Queen,
1 Rose, Pearl Queen,
1 Rose, Ruby Queen
1 Rose, Maddalena Scelarandis,
1 Rose, Frau Karl Druschke,
1 Rose, Helen Gould,
1 Rose, Vick's Caprice,
1 Rose, La Reine,
1 Rose, Paeonia,
1 Rose, Madame Gabriel Luizet,
1 Rose, Marshall P. Wilder,
2 Eulalia Japonica,
2 Eulalia Japonica Zebrina,
2 Eulalia Japonica gracillima,
2 Eleagnus angustifolia,
4 Acer spicatum,
2 Ampelopsis (self-fastening),
10 Berberis Thunbergi,
2 Berberis canadensis,
4 Cornus purpusa (Japan),
2 Crataegus Arkansana,
2 Crataegus Arnoldiana,
2 Crataegus Apiosa,
2 Crataegus Coccinoides,
2 Crataegus Carnieri,
1 Crataegus sub-mollis,
2 Lonicera mundeniensis,

From Central Experimental Farm, Ottawa—*Continued.*

2 Lonicera virginalis alba,
2 Lonicera Alpina,
2 Lonicera Fenzlii,
2 Celastrus scandens,
2 Euonymus linearis,
2 Euonymus Bungeana,
2 Euonymus Europeus ovatus,
2 Fraxinus Mandschuricus Sapporo,
2 Fraxinus Bungeana,
2 Philadelphus Manteau d'Hermine,
2 Prunus Alleghenensis,
2 Blue Spruce (Kosteriana),
1 Pyrus Maulei Sargenti,
2 Picea alcockiana,
4 Abies remonti,
2 Philadelphus Mont Blanc,
2 Aristolochia Sipho,
2 Catalpa speciosa.

From A. P. Stevenson, Nelson, Man.—

1 Black Elderberry.
1 Siberian Almond,
1 Silver Maple.
1 Lombardy Poplar.
1 Mountain Ash.
1 Tamarac.
1 Wild Grape.

From Sherman Nursery Co., Charles City, Iowa—

100 Carolina Poplar Cuttings.
2 Mountain Ash.

TREE SEEDS.

The Native Maples, which yielded no seed in 1906, owing to the blossoms having been killed by spring frost, gave an abundant crop in 1907, and there is a good supply on hand for distribution among settlers in the spring of 1908, and also for growing a supply of seedlings for the following year's distribution.

Many other tree and shrub seeds ripened, and as much as possible was gathered with a view of raising seedlings to be distributed throughout the country.

Directions for sowing tree seeds were given in my last report, but as many new settlers are constantly arriving who will require information on the subject, I repeat the information then given.

SOWING TREE SEEDS.

Many inquiries are made during the year as to the best way to grow tree seeds in the Northwest, where usually at the time they are sown, the soil is very dry. For several seasons, little or no trouble has been experienced from this cause on the Experimental Farm, while in some districts the weather has been very dry.

Maple seeds can be sown late in October, or early in May. It is not safe to sow all the supply of maple seed in the fall, as very often germination takes place too early in the spring, and frost kills the entire crop.

Ash seed should be sown in October. Elm seed should be sown as soon as gathered in June, though it sometimes succeeds if sown the following spring.

Elm seed requires a very light covering of fine moist soil, not over ½-inch in thickness, while maple and ash should be covered 1 or 1½ inches.

Tree and shrub seeds should be sown in rows about 30 inches apart to permit horse cultivation when considerable quantities are grown. In all cases the land should be prepared the year preceding sowing, so as to have the soil as fine as possible. Breaking and backsetting new land, and summer-fallowing old, make the best and safest preparation.

Trees should be transplanted when seedlings are 2 years old. When left until 3 or 4 years old, the trouble and expense are greatly increased.

HEIGHT AND GIRTH OF TREES.

As information is frequently requested regarding the rate of growth of different varieties of trees, a number of trees of the principal varieties grown on the farm were measured in January, 1908. The circumference in inches is given at two different heights, the altitude in feet (which was obtained by trigonometry), the situation, and the year when planted. Most of the trees mentioned would be one or two years old when set out in their present location.

Variety.	Year planted.	Location.	Girth 1 foot above ground.	Girth 4 feet above ground.	Height.
			Inches.	Inches.	Feet.
Russian Poplar	1892	Isolated	57	42	40
American Cottonwood	1892	Windbreak	33	27	48¼
" "	1892	Isolated	45	48	41½
" "	1892	In clump	35	29	43
Native Maple	1892	Isolated	38	27	25
Native Elm	1892	"	26	24	29¾
"	1895	Arboretum	21	20	22¼
Native Ash	1895	"	18	16	22¾
Paper Birch	1900	"	17	15	22
Willow (S. daphnoides)	1895	"	20	17	25
Mountain Ash	1890	"	13	11	17¾
Riga Pine	1892	Plantation	21	18	26
"	1892	"	29	25	27¼
"	1892	Isolated	18	16½	21½
White Spruce	1892	In clump	16	13	22¾
Blue Spr ce	1895	Arboretum	15	11½	15[illegible]
Balsam Fir	1897	"	17	11½	15¾
Tamarac	1896	"	17	15	22¾

FRUIT TREES.

The following fruit trees were planted last spring. (From Central Experimental Farm, Ottawa).

Apples.—Russian Seedlings.

1 Earliana.
1 Jasper.
1 Mentor.
1 Dauphin.
1 Osler.
1 Beaver.
2. Bomba,
1 Murillo.
1 Nestor,
1 Leroy.
1 Galena
1 Otter.
1 Dewar.
1 Bison.
1 Parma.
2 Cottage,
1 Harbinger.
1 Carlyle.

Apples.—Other Hardy Sorts.

2 Lowland Raspberry.
2 Patten's Greening.
2 Dudley.
4 Milwaukee.
2 Whitney Crab.
1 Alexander.
1 Baxter.
2 Okabena.
1 Calumet.
1 Canada Baldwin.
1 Seedling from Miss Fowler.
1 Hare Pipka.
1 Lead of St. Petersburg.

Apples, &c.—Other Hardy Sorts—Continued.

1 Lubsk Queen.
1 La Victoire.
1 Langford Beauty (on Dartmouth C.)
1 Lyman Prolific Crab.
1 Marmalade.
2 Stone of Vermont.
1 Sugar Myron.
2 No. 2. (from Miss ———, Finland).
9 Jewel.
4 Robin.
10 Silvia.
1 Cowley.
1 Osman.
5 Prince.
10 Magnus.
10 Golden.
2 Kent.
1 Josie.
3 Carsterson Plum Seedlings.

Apples, &c., from the Jewell Nursery Co., Lake City, Minnesota.

2 Wolf River Apple.
2 Duchess.
2 Dartt.
2 Early Strawberry.
2 Florence Crab.
2 Good Peasant.
2 Hyslop Crab.
2 Jewell's Winter.
2 Longfield.
2 Martha Crab,
2 Minnesota Hybrid.
2 Northwestern Greening.
2 Orange Crab.
2 Peerless.
2 Repka Malenka.
2 Tetofsky.
2 Yahnke.
2 Yellow Transparent.
2 Wealthy.
2 University.
2 Transcendant.
1 Okabena, also
2 Aitkin Plum.
2 Cheney Plum.
2 De Soto Plum.
2 Compass Cherry.

Apples, &c., from A. P. Stevenson, Nelson, Manitoba.

1 Hibernal.
1 Charlamoff.
1 Blushed Calville.
1 Simbirsk.
1 Whitney No. 20.
1 Hyslop Crab.
1 Trascendant and
1 Compass Cherry.

From South Dakota Experiment Station, Brookings, S.D.

1 S. D. No. 3 Sand Cherry.
1 S. D. No. 5 Sand Cherry.

And 15 Native Plum seedlings Nos. 7 to 21, inclusive, selected out of 6,000 grown at S. D. Experimental Station.

FRUIT CROP.

CRAB APPLES.

I regret having to report an extensive destruction of the crab apple trees by rabbits during the winter of 1906-7. Luckily this was confined mainly to the first plantation set out, where the trees were mostly seedlings, and many of them were being rooted out. The plantations put out since 1901 escaped with few losses, and during the past season made a good growth, though a number of the varieties proved rather tender for the very severe weather of last winter. Last fall, the trees not injured were wrapped with building paper, but so far, this winter few rabbits are to be found among any of the plantations on the farm, and no harm has been done.

As a number of the cross-bred apples fruited for the first time last fall, the size of the fruit was measured, and is given below.

In Orchard II.

	Inch.
Seedling of Progress	$\frac{7}{8}$
Seedling of Pauline	$\frac{3}{4}$
Seedling of Charles	1
Seedling of Prairie Gem	$\frac{7}{8}$
Seedling of Dean	1
Seedling of Novelty	$1\frac{1}{4}$
Seedling of Cavan	$\frac{3}{4}$
Seedling of Pioneer	$\frac{7}{8}$
Pyrus malus pendula	$\frac{3}{4}$
P. B. 2550	$\frac{5}{8}$

In Orchard III.

	Inch.
Seedling of Progress	$\frac{7}{8}$
Seedling of Prairie Gem	$\frac{3}{4}$
Seedling of Aurora	$1\frac{1}{8}$
Seedling of Charles	$\frac{3}{4}$

In Orchard IV.

	Inch.
Eaton	1
Hunter	$\frac{7}{8}$
Carleton	1
Cavan	$1\frac{1}{2}$
No. 19	1
Aurora	$1\frac{1}{4}$
No. 12	$\frac{3}{4}$
No. 45	$1\frac{3}{8}$
Northern Queen	1
No. 116	$1\frac{1}{4}$
Charles	$1\frac{1}{2}$
Derby	$1\frac{1}{8}$
Pioneer	$1\frac{1}{8}$
Seedling of Aurora	$1\frac{1}{4}$
Seedling of Prairie Gem	$\frac{7}{8}$
Seedling of Cavan	$\frac{3}{4}$

In Orchard VI.

	Inch.
Prince	$1\frac{3}{8}$
Tony	$1\frac{1}{4}$

PLUMS.

Not a single plum ripened its fruit the past season; the late spring and cold season was against them. The trees were fairly well loaded.

In small fruits, the Currant and Gooseberry bushes were again infested with the Currant Maggot, which has destroyed the fruit for the past two years. The failure was not so complete as in 1906.

Raspberries gave a fair crop. The varieties grown at present are Dr. Reider, Turner, Marlboro and Herbert.

EXCURSIONS TO THE FARM.

On July 10 and 11 last very large crowds of farmers and others visited the Experimental Farm from points along the railway from Fleming on the east to Moosejaw on the west, and along the Soo and Arcola lines.

The excursion was under the auspices of the Department of Agriculture, Regina. A free lunch was provided by the Department for the visitors, and served by the Indian Head hospital directors as in the previous year.

Both days were perfect for pleasure and sightseeing, and the visitors seemed well pleased with their outing.

Dr. Wm. Saunders, C.M.G., Director of Experimental Farms, and Hon. W. R. Motherwell, Minister of Agriculture, Regina, gave addresses on both days.

HORSES.

There are 13 head of horses on the farm. Two are used for the roads and light work, two are very old and are only able to do scuffling, &c., and the others do the regular work on the farm, such as ploughing, cultivating, road work, teaming, &c. Usually 150 acres are summer-fallowed each year, and with keeping the roads and test plots of all sorts in order, not much time is spent in idleness.

POULTRY.

The breeds of poultry kept on the farm consist of Barred Plymouth Rock, Buff Orpington and Black Minorca.

BEES.

Five hives were put in the cellar in November, 1906, and came through the winter safely. Last season they increased to 12. Forty pounds of honey were obtained during the season.

INSTITUTE MEETINGS ATTENDED.

On account of pressing work on the farm, I was able to attend only a few meetings during the past year. Those attended were at Dundurn, Hanley, Bladworth, Davidson and Craik on the Regina and Prince Albert line, and a few Agricultural Society meetings near home.

It was again my privilege last summer to vist the northern and northwestern portions of the province in company with yourself, and in nearly all districts found the crops looking very promising. This was chiefly the case in the north, while some parts of the west seemingly required more moisture.

CATTLE.

The herd at present contains 58 head, composed of 30 pure-bred and 28 cross-bred animals, 6 of the latter being three-year-old steers purchased for feeding tests.

Early in the winter all the animals were tested for tuberculosis, and were found healthy with the exception of two of the steers purchased for feeding, and a pure-bred heifer, who was considered suspicious. The steers were slaughtered and inspected by the health inspector, who pronounced them free of disease. One of them had one of the glands enlarged. The heifer was kept isolated for two months and then retested. No reaction took place in the latter test.

FEEDING TESTS OF STEERS WITH FROSTED WHEAT.

During the winter of 1907-8 two lots of Shorthorn Grade steers were fed on frozen wheat chop, and as much oat or barley straw as they required. Lot 1 consisted of four rising two-year-olds, and lot 2 of six rising three-year-old steers.

The test lasted 16 weeks, from November 26 to March 17. The wheat chop was fed to both lots at the rate of 2 lbs. per day per head, for the first period of 4 weeks, 3 lbs. for the 2nd period, 6 lbs. for the 3rd, and 8 lbs. for the last 4 weeks.

Linseed meal was fed—1 lb. per day to each animal—from February 1 to the end of the test—46 days.

Following will be found particulars of the weights and gains of each lot; quantity and value of feed consumed, and financial result of the transaction.

WEIGHTS AND GAINS DURING TEST.

—	Lot 1.		Lot 2.	
	Weight.	Gain.	Weight.	Gain.
	Lbs.	Lbs.	Lbs.	Lbs.
Start of test	3,650	....	5,815	....
End of 1st month	3,690	40	5,870	55
End of 2nd month	3,750	60	6,160	290
End of 3rd month	3,960	210	6,450	290
End of 4th month	4,200	240	6,750	300
Total gain during test	....	550	....	935
Average gain per head	....	137	....	156

TOTAL WEIGHT AND ESTIMATED VALUE OF FEED CONSUMED DURING 112 DAYS OF TEST.

—	Lot 1.	Lot 2.
Frozen wheat chop	35½ bushels at 35 cents..$ 12 42	53⅛ bushels at 35 cents..$ 18 62
Linseed meal	184 lbs. at 4 cents.... 7 36	276 lbs. at 4 cents 11 04
Total cost	..................$ 19 78	..................$ 29 66
Cost per head	..................$ 4 94	..................$ 4 94

Account of straw feed was not kept.

SUMMARY OF FINANCIAL RESULT OF THE TRANSACTION.

—	Lot 1.	Lot 2.
Weight at start	3,650 lbs.	5,815 lbs.
Value at 3 cents per lb	$109 50	$174 45
Cost of feed	19 78	29 66
Total cost	129 28	204 11
" per head	32 32	34 02
Weight at finish	4,200 lbs.	6,750 lbs.
Less 5 p.c., shrinkage	210 lbs.	337 lbs.
Net weight	3,990 lbs.	6,413 lbs.
Value at 4c. per lb	$159 60	$256 52
" per head	39 90	42 75
Net profit	30 32	52 41
" per head	7 58	8 73

The advantage in feeding wheat of low grade instead of selling it on the market is illustrated by the preceding test. Following are the exact figures:—

—	Lot 1.	Lot 2.
Quantity of wheat fed	35½ bushels.	53⅕ bushels.
Grade	No. 2 feed.	No. 2 feed.
Value at 35 cents per bushel	$12 42	$18 62
Lbs. of beef produced	550 lbs.	935 lbs.
Less 5 p.c., shrinkage	523 lbs.	888 lbs.
Value at 4 cents per lb	$20 92	$35 52
Return, per bushel, wheat fed	0 59	0 66¾
Gain, per bushel, resulting from feeding instead of selling	0 24	0 31¾

SWINE.

Two breeds, Berkshire and Yorkshire White, are kept, and at this date the stock consists of 1 Berkshire boar and 1 sow, 4 Yorkshire boars and 6 sows. There are also 9 grade hogs and 12 sows of Yorkshire-Berkshire cross.

SWINE—FEEDING TEST WITH FEED WHEAT.

Feeding tests were carried on with two pens of cross-bred pigs, lot 1 consisting of 8 pigs and Lot 2 of 7 pigs. The cross was Yorkshire boar on Berkshire sows. The ration fed was No. 2 Feed Wheat, ground, and fed 3 times a day.

The test commenced as soon as threshing was over, and the wheat available.

The pigs were all about 6 months old when the test began on November 5, those in Lot 1 being born on May 9, and Lot 2 on May 16.

The test was continued for 16 weeks, and the pigs were weighed at the end of every 4 weeks.

Results of the test are given below.

—	Lot 1.				Lot 2.			
	Weight.	Gain.	Grain fed.	Lbs. feed to 1 lb. of gain.	Weight.	Gain.	Grain fed.	Lbs. feed to 1 lb. of gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Start of test	840	....	....	....	590	....	....	....
End of 1st month	1,110	270	1,084	4·01	796	206	948	4·6
End of 2nd month	1,440	330	1,090	3·30	1,060	264	952	3·6
End of 3rd month	1,710	270	912	3·38	1,290	230	875	3·8
End of 4th month	1,950	240	1,014	4·22	1,475	185	945	5·7
Total	....	1,110	4,100	....	....	885	3,720	
Average per head	....	139	512	3·7	....	126	530	4·2

Particulars as to the value of the wheat fed, and of the pork produced by feeding it, are given below:—

—	Lot 1.	—
Quantity of wheat fed	68⅓ bushels	62 bushels
Grade	No. 2 Feed	No. 2 Feed
Value at 35c. per bushel	$23.92	$21.70
Lbs. pork produced	1,110 lbs.	885 lbs.
Less 5 p.c. shrinkage	1,055 lbs.	841 lbs.
Value at 5c. per lb	$52.75	$42.05
Return per bushel wheat fed	·77	·67¾
Gain per bushel resulting from feeding instead of selling on market	·42	·32¾

DISTRIBUTION OF SAMPLES.

Last spring the usual distribution of the products of the Farm was made to residents in the Provinces of Saskatchewan and Alberta.

A list of the samples sent out is given below:—

	Bags.	Lbs.
Wheat	252	3
Oats	312	3
Barley	116	3
Peas	58	3
Sundries (flax, rye, spelt)	8	3
Potatoes	600	3
Shrub seeds	30	½
Grass seed, Western Rye	26	1
Garden Peas	367	1
Garden Corn	280	½

Small seeds, 350 bags containing 5,250 packages of shrub, flower, root and garden seeds.

	Parcels.
Rhubarb roots	106
Fruit bushes and cuttings	108
Tree and shrub seedlings	1,000
Express parcels of trees and shrubs	51

CORRESPONDENCE.

During the twelve months ending March 31, 1908, 8,120 letters were received and 8,082 mailed from this office.

In letters received reports on samples are not included, and in letters mailed circulars of instruction sent out with samples are not counted.

METEOROLOGICAL RECORD.

Month.	Temperatures.				Rainfall.		Snowfall.	Bright Sunshine.
	Maximum.		Minimum.					
1907.	Date.	°	Date.	°	Days.	Inches.	Inches.	Hours.
April	30	46	16	—3	1	·05	9·50	187·9
May	15	70	5	6	7	95	....	192·4
June	27	86	3 & 4	34	16	6·07	....	187·8
July	4	84	31	41	10	1·58	....	241·4
August	8	84	20	33	14	3·91	....	211·1
September	5	71	28	22	8	2·14	....	174·6
October	15	71	26	12	2	·23	....	183·3
November	6	55	13	1	.....	....	1·25	84·
December	5	48	27	—27	.....	....	6·50	55·4
1908.								
January	20	40	29	—33	.....	....	2·50	94·
February	22	39	1	—29	.....	....	10·00	83·4
March	11	43	8	—32	.....	....	12·00	124·4
					58	14·93	41 75	1,819·7

I have the honour to be, sir,
Your obedient servant,

ANGUS MACKAY,
Superintendent.

Barn and Implement Shed at Experimental Farm, Lethbridge, Alberta.

Photo by C. E. Saunders.

EXPERIMENTAL FARM FOR SOUTHERN ALBERTA.

REPORT OF W. H. FAIRFIELD, M.S., SUPERINTENDENT.

LETHBRIDGE, ALTA., March 31, 1908.

Dr. WM. SAUNDERS,
Director Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to submit my report of the work done on the Lethbridge Experimental Farm since possession was obtained in August, 1906.

The farm consists of 400 acres located one mile east of the corporate limits of the city of Lethbridge and is crossed by the Crows Nest Branch of the Canadian Pacific Railway.

This land together with the water rights was donated to the government by the Alberta Railway and Irrigation Company. A strip of land on the east side of the farm running north and south containing 100 acres is irrigable, the remaining three-fourths of the farm is non-irrigable, which leaves nominally 300 acres on which to conduct experiments without irrigation or under 'dry farming' conditions. The soil of the farm is quite uniform being a dark gray colored loam and is similar to a great portion of the soil found in this district, although being perhaps slightly lighter in character than some.

The farm was virgin prairie when possession was obtained. On account of the dryness of the soil and the lateness of the season only about ten acres were broken that autumn. The farm was fenced during the autumn and winter.

BUILDINGS.

Early in the season of 1907 the construction of the buildings was begun. A commodious barn 38 feet by 72 feet was erected. The greater part of the ground floor is laid out in stalls for the work horses, but one end is partitioned off for carriages. On the second floor is a room in which are the feed bins. The rest of this space forms a roomy hay loft with ample capacity to store all the hay required for the stock.

Another two story building 78 feet by 28 feet has been built. The ground floor to be used for the storing of implements and tools, with sufficient room at one end in which to operate a small threshing machine. The upper floor is to be used as a general work room and storage place for grains. This building also has a lean-to roof on the north side covering a space 60 feet by 16 feet for the accommodation of wagons, &c.

A two-story residence for the Superintendent has been built which contains nine rooms, one of which is fitted as an office. A six-roomed, story and a half, cottage 34 feet by 28 feet, used as a boarding house, has also been constructed.

GENERAL WORK.

During the spring and early summer 145 acres of land was broken, which with the ten acres broken in the autumn of 1906 makes a total of 155 acres. Of this amount 47 acres is on the irrigated portion, the remainder being on the non-irrigated part. In August this land was back-set with the exception of about 15 acres, which was reserved so that a test could be made to show the effect of backsetting on grain crops as compared with the land merely broken. No spring crops were sown.

TREES AND SHRUBS.

Early in April, 1907, three acres of land was prepared as well as circumstances would permit and the following material, supplied principally from the Central Farm at Ottawa, was set out in nursery rows, so that it might be on hand for early planting in the spring of 1908.

Apples.—There were 37 of the hardiest varieties of Russian Seedlings, 51 varieties of other hardy sorts, 20 varieties of Cross-bred apples and 187 seedling trees from the Cross-bred varieties, the total number of trees set out being 551.

Plums.—Twenty-two varieties were planted.

Raspberries.—Three varieties were set out.

Currants, Black.—Twenty varieties were planted.

Currants, Red.—Twenty-four varieties were planted.

Currants, White.—Nine varieties were planted.

Gooseberries.—Four varieties were set out.

A very fine collection of ornamental trees and shrubs consisting of 234 varieties in all, were set out. A collection of 25 varieties of Pæonies were also put in.

Several hundred small Elms, Ash, Manitoba Maple and Cottonwoods, to be used for general planting on the farm, were set out.

Although the soil in the nursery was in poor tilth owing to the fact that it was fresh broken sod, still nearly all the material lived and made satisfactory growth during the summer.

In the autumn 186 varieties of hardy perennial plants were received and planted. Several hundred cuttings of 12 varieties of Poplars and 5 varieties of Willows were received and heeled in ready to be set out in the spring.

WINTER WHEAT.

With the object in view of getting a supply of pure Turkey Red Wheat and if possible an improved strain, 60 bushels of hand selected seed was purchased from the Kansas Agricultural College. Part of this seed consists of Kharkof and the remainder Turkey Red No. 380. Eight acres each, of these two strains were planted alongside of the best Alberta grown Turkey Red that could be found. Another field of over 28 acres was sown with Kharkof from which to obtain seed in quantity.

To obtain data regarding the best time to sow winter wheat, about which there seems to be some diversity of opinion among the farmers of Southern Alberta, plots of one-eighth acre were sown every two weeks, or more exactly in the middle and end of each month, beginning with August 15. The last sowing was made November 30.

During the past two or three years some rather striking results have been obtained in the district from light seedings of winter wheat. To gain information along this line eight plots of one-eighth acre each were sown September 3. The first at the rate of one peck per acre, the second at two pecks per acre, the third at three pecks per acre and so on up to two bushels per acre.

One-sixteenth acre plots of 10 varieties of winter wheat were sown on August 31.

RYE.

One-fourth acre of winter rye was sown on August 31.

WINTER BARLEY.

One-sixtieth acre of winter barley, seed of which was obtained from the Kansas Agricultural College, was sown September 17, and came up well as did, in fact, all the winter grain except that which was sown later than October 1.

BACKSETTING.

In this district it is not customary to backset the land that is broken for winter wheat (or for any grain crop). To ascertain what advantage the backsetting has, some of the fields sown were arranged so that they would consist partly of land merely broken with the balance backset.

IRRIGATION.

Information relative to the 'duty of water' or in other words, information regarding the actual amount of water required to irrigate various crops, is already being demanded by the users of water in the district. As no investigations along this line have yet been carried out in this country and realizing the importance of gathering data dealing with the subject, plans have been made so that all the water which is turned out of the irrigation company's ditch for the experimental farm will be measured over a weir and a record kept of the exact amount by means of a self-recording register. Arrangements are now being made with the Lallie Surveying Instrument and Supply Company, of Denver, Col., for one of their water registers which they are modifying somewhat to suit our particular needs.

Not only will a record of the amount of water received each day for the entire season be made, but for each individual crop as well. Accumulation of such data as this for a number of years will be of much value to all parties interested in irrigation problems.

I have the honour to be, sir,
Your obedient servant,

W. H. FAIRFIELD,
Superintendent.

EXPERIMENTAL FARM FOR CENTRAL ALBERTA.

REPORT OF G. H. HUTTON, B.S.A., SUPERINTENDENT.

EXPERIMENTAL FARM, LACOMBE, ALTA.,
March 31, 1908.

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SIR,—I have the honour to submit to you the first annual report of the work done during the year 1907, on the Experimental Farm for Central Alberta at Lacombe.

The climatic conditions of the year were unusual, the winter of 1907 being exceptional for low temperatures and an excessive snowfall. The spring was backward, seeding greatly delayed, while the entire summer was characterized by cool waves, frost occurring at different times in August doing damage to grain and potato crops in many districts. While the weather was cool, there was a remarkable growth of straw, but grain matured slowly and harvest was late. The winter of 1907-8 has been moderate, temperatures have been fairly uniform and a light fall of snow coming early in December remained almost all winter, affording protection to winter wheat.

THE SITE OF THE EXPERIMENTAL FARM.

The land comprising the Experimental Farm became the property of the Department of Agriculture in March, 1907. Lacombe is situated almost midway between Calgary and Edmonton on the Calgary and Edmonton Railway, which is operated by the Canadian Pacific Railway Company. The latter road has a line running east from Lacombe; Stettler, Alberta, being the present terminus. It is expected that this line will be connected with the main line of the Canadian Pacific eventually. In locating the Experimental Farm at Lacombe, a central location for the country served was secured and one which is accessible from the districts tributary thereto. The land has a pleasing location, one mile southwest of Lacombe, lies to the southeast, is crossed toward the eastern boundary by the Calgary and Edmonton trail and by the Calgary and Edmonton Railway, from both of which lines of public travel, a full view of the Farm can be had. The soil on the Farm represents, as nearly as any one farm can be found to represent, the average land in the central section of Alberta now served by railways, and the results secured here should be a guide to farm practice over this portion of the province.

BUILDINGS.

New buildings were required and preparations were made to erect the necessary structures with as much dispatch as possible.

A cottage for the accommodation of workmen was the first building completed. Concrete walls support the frame, which is 25 feet by 32 feet, with a kitchen 13 feet by 16 feet. It is finished in six rooms and is provided with cellar, pantry and hall.

The barn, 70 feet by 40 feet by 18 feet, was next erected. Four concrete walls support the building, which is used at present as a combination of stable, drive house and workshop with a feed loft overhead. The stable is 10 feet in the clear, while the

distance from the floor over the stable to the ridge is 28 feet, providing ample storage capacity for all feed required for one year by the present stock. The stable section of the building is provided with harness-room, feed-room, two double stalls and three single stalls for horses, three box stalls for horses or cattle, and three single stalls for cattle. The cattle stalls are fitted with swinging adjustable stanchions. A well in the passage of the stable section provides water for stock. Parallel with the barn, 60 feet west, the implement shed was built and is 60 feet by 20 feet, being fitted on the east side with sliding doors and lighted by windows in the side. By connecting these buildings at each end with a board fence eight feet in height, a comfortable enclosure for stock was made.

In October the residence for the Superintendent was completed. This building is on a concrete wall, having a two-thirds excavation and is full two-story with the exception of the kitchen wing. It is heated by a hot-air furnace, is equipped with full bath-room fixtures, water being supplied by wind-mill. The sewage is disposed of through a soil-pipe sewer to a cess-pool to which there is ample fall.

FENCING.

A fence of woven wire two miles in length was built during the fall. A 9 strand fence, 9 and 11 gauge wire with perpendiculars 12 inches apart was used for the public road, while an 8-strand fence of the same weight of wire was erected on the less public lines. Split cedar posts were used and were set three feet in the ground, one rod apart.

EXPERIMENTAL WORK.

Seed was supplied by the Central Experimental Farm and steps were taken to inaugurate experimental work in 1907 though spring was almost at hand when the land was secured. One hundred and twenty-five experiments with cereals were conducted in 1907 as were also the uniform tests with roots and potatoes.

EXPERIMENTS WITH SPRING WHEAT.

The season of 1907 was not a favourable one for maturing cereals. The spring was late in opening, and from the fact that much ploughing was necessary, a large percentage of the spring grains in the province was sown late. During May and June growth was rapid, but August was cool and frost was prevalent throughout the country on the 6th, 18th, 29th and 30th of the month. The earlier frosts did little damage, but the frost at the close of the month caught much of the later grain. All our wheat tests on the Experimental Farm gave promise of heavy yields, the straw was as a rule holding up well, while the length of some of the heads was remarkable. Seventeen varieties of spring wheat were tested in plots of one-sixtieth of an acre each.

The soil had been fall-ploughed and last spring was disced and harrowed and firmed by using a soil-packer. All plots were sown on May 1, at the rate of one and one-half bushels per acre. The soil was a clay loam, being sharpened by the presence of a small percentage of sand. All cereal crops on this farm were comparatively free from rust or smut, and the straw, particularly that of oats and barley, was very bright and should have a marked value for feeding cattle. The number of days required to mature the various varieties is not given owing to the impossibility of accurately determining this fact in such an unfavourable season when some varieties did not reach full maturity.

SPRING WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Date of Sowing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Measured Bushel after Cleaning.
				In		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Percy A.	Black clay loam.	May 1	50	Strong..	4	Bald	6,746	34	..	60
2	Bishop A	" ..	" 1	48	Medium..	4½	"	6,480	33	..	52
3	Chelsea	" ..	" 1	46	" ..	3	Bearded..	6,480	32	..	52
4	Stanley A.	" ..	" 1	50	Strong....	3½	Bald	6,380	31	..	36
5	Preston	" ..	" 1	49	"	4½	Bearded..	6,180	29	..	52
6	Colorado	" ..	" 1	54	Weak	4	" .	6,380	25	..	44
7	Yellow Cross	" ..	" 1	48	Strong....	3½	" ..	5,840	25	..	52
8	Marquis	" ..	" 1	43	"	3½	Bald	5,400	24	.	44
9	Downy Riga D.	" ..	" 1	40	Weak	3	"	5,580	23	30	60
10	White Russian	" ..	" 1	54	Strong....	5	"	6,040	21	..	44
11	Hungarian White	" ..	" 1	53	Medium .	4	Bearded..	5,140	20	..	44
12	Pringle's Champlain	" ..	" 1	45	Weak	4	" ..	6,000	18	..	44
13	Huron	" ..	" 1	48	Medium..	4½	" ..	6,360	17	30	48
14	Herisson Bearded	" ..	" 1	51	Weak	3½	" ..	5,320	17	..	50
15	Red Fern	" ..	" 1	48	Strong....	3½	" .	5,740	15	..	44
16	White Fife	" ..	" 1	54	" ..	4	Bald	6,380	13	..	36
17	Red Fife	" ..	" 1	42	Weak	3½	"	5,740	9	..	36

EXPERIMENTS WITH DURUM OR MACARONI WHEAT.

Four varieties of durum wheat were sown on May 1 at the rate of one and one-half bushels of seed per acre. The soil and its preparation was similar to that on which the other sorts of spring wheat were grown.

DURUM OR MACARONI WHEAT—TEST OF VARIETIES.

Name of Variety.	Character of Soil.	Date of Sowing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.	Weight per Measured Bushel after Cleaning.
			In.		In.		Lbs.	Bush.	Lbs.
Yellow Gharnovka	Black clay loam.	May 1..	60	Medium..	3	Bearded..	7,160	24	44
Goose	" ..	" 1..	54	Strong....	3	" ..	6,880	23	44
Roumanian	" ..	" 1..	54	Weak	3½	" ..	5,860	20	44
Mahmoudi	" ..	" 1..	49	Medium..	3½	" ..	6,740	20	40

EXPERIMENTS WITH EMMER AND SPELT.

Two varieties of Emmer and two of Spelt were tested on similar soil and with the same preparation as for spring wheat. The seed was used in the proportion of 120 pounds per acre.

EMMER AND SPELT—TEST OF VARIETIES.

Name of Variety.	Character of Soil.	Date of Sowing.	Length of Straw, including Head.	Character of Straw	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.
			In.		In.		Lbs.	Lbs.
Common Emmer	Black clay loam.	May 1..	50	Weak	3½	Bearded..	5,680	1,200
Red Spelt..............	" ..	" 1..	48	"	2	Bald	4,840	1,020
White Spelt...............	" ..	" 1..	51	Strong....	4¼	"	5,360	840
Red Emmer..............	" ..	" 1..	49	Weak	3	Bearded..	6,840	540

EXPERIMENTS WITH OATS.

Thirty-two varieties of oats were tested this year. All were sown on fall ploughed stubble land, black clay loam that had been under grain crops for eleven years. No fertilizer in any form was applied, but the yield of grain and the growth of straw were both good and, had the crop not been injured by frost during the latter half of August, even better yields would have been secured.

The tests were made on one-sixtieth of an acre plots which were sown at the rate of two bushels per acre on the 3rd and 4th of May.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Wheat per Measured Bushel after Cleaning.	Rusted.
			In.		In.		In.	Bush.	Lbs.	Lbs.	
1	Pioneer............	Black clay loam.	54	Strong..	12	Branching	6,480	110	10	40	None.
2	Golden Beauty.....	" " .	55	Weak ..	11	" .	6,340	109	14	40	Slightly.
3	Danish Island.....	" " .	55	Medium	11	" .	6,400	107	22	38	None.
4	Storm King......	" " .	54	Strong.	14	Sided.....	7,060	98	28	38	"
5	White Giant.......	" " .	48	Medium	10	Branching	6,380	95	10	41	"
6	Tartar King......	" " .	55	Weak...	10	Sided.....	5,420	92	22	38	Slightly.
7	Banner......	" " .	52	" ..	9	Branching	5,620	92	22	38	None.
8	Swedish Select.....	" " .	52½	Medium	8	" .	5,620	92	22	41	Slightly.
9	Sensation	" " .	52	Strong..	9	" .	6,440	92	22	40	None.
10	Irish Victor	" " .	52	Medium	9	" .	4,980	91	26	31	"
11	Black Beauty......	" " .	54	Weak...	9	" .	4,960	90	..	41	"
12	American Triumph.	" " .	52	Strong..	9	" .	6,400	89	4	37	"
13	Bavarian	" " .	57	Medium	8	" .	6,780	88	8	38	"
14	Improved American	" " .	51	" .	9	" .	5,440	88	8	37	"
15	Siberian...........	" " .	53	" .	8	" .	6,860	87	12	34	"
16	Virginia White....	" " .	51	" .	7	" .	5,740	87	12	40	"
17	Twentieth Century.	" " .	55	Weak...	10	" .	6,000	85	20	34	"
18	Wide Awake.......	" " .	51	" ..	8	" .	6,460	84	24	38	"
19	American Beauty..	" " .	51	Medium	10	" .	7,160	83	28	41	Slightly.
20	Improved Ligowo..	" " .	47	Strong..	8	" .	6,380	83	28	40	None.
21	Abundance	" " .	52	Medium	10	" .	6,180	83	28	39	"
22	Thousand Dollar...	" " .	58	Weak...	11	" .	6,480	82	32	38	"
23	Goldfinder	" " .	59	" ..	12	" .	6,320	81	6	36	"
24	Milford White.....	" " .	52	" ..	9	Sided.....	5,400	81	6	38	"
25	Kendal Black ..	" " .	55	Medium	10	"	5,940	81	6	41	"
26	Golden Fleece	" " .	53	Weak...	8	Branching	5,960	77	22	35	"
27	Lincoln.......... ..	" " .	60	Medium	10	" .	4,800	75	30	36	"
28	Newmarket..	" " .	48	" .	9	" .	6,060	74	4	39	"
29	Kendal White......	" " .	53	Weak...	9	" .	5,460	73	8	38	"
30	Columbus..........	" " .	50	Medium	8	" .	5,880	70	20	35	"
31	Golden Giant......	" " .	49	"	9	Sided.....	5,840	60	..	34	"
32	Joanette...........	" " .	44	Weak...	8	Branching	6,000	49	14	35	"

Seeding Plots on Experimental Farm, Lacombe, Alberta, 1907.

FALL SOWING OF OATS.

Volunteer grains appear to do well in this country and vital seed scattered on the ground during harvest whether ploughed down in the fall or left on the surface until incorporated with the soil in spring, appears to germinate well and ripen a week to ten days earlier than spring sown grain of the same variety. One acre of Tartar King Oats was sown on November 9 and one acre will be sown the momemt the soil is in condition this spring and comparisons will be made. If yields are found to be approximately equal, a distinct time-saving would be made by those whose land was in condition to receive the seed in the fall.

PACKED AND UNPACKED SOIL.

A test was begun this year and it is proposed to be continued for some years to ascertain to what extent a soil packer has value as a means of conserving soil moisture and of bringing the seed into immediate close contact with the moist soil, promoting a quicker and more uniform germination. The soil packer in various forms has already some strong advocates. Professor Campbell, of dry-farming fame in the United States, travelled this country during June and July under the direction of the Provincial Department of Agriculture, explaining his method. With a view to determine whether the packer deserves a place among farm implements in this district this work was undertaken.

Variety.	Date of Sowing.	Amount of Seed per Acre.	Treatment.	Yield per Acre.	Weight per measured Bushel.	Strength of Straw.
		Bushels.				
Banner	May 10	2	Packed	78·28	34	Medium.
"	" 10	3	"	88·8	34	"
"	" 10	4	"	79·14	32	"
"	" 10	2	Unpacked	72·12	32	Weak.
"	" 10	3	"	70·20	32	"
"	" 10	4	"	69·24	34	"

EXPERIMENTS WITH BARLEY.

Experiments were conducted with twenty-eight varieties of barley during the season of 1907, fifteen of which were six-rowed sorts and thirteen were two-rowed. The soil was a black clay loam that was fall-ploughed and thoroughly disced, harrowed and packed in spring before seeding. Frost entered into the reckoning in determining the yield for barley, but, notwithstanding the vagaries of this peculiar season, a fair crop of barley of fair quality was harvested. The plots were one-sixtieth of an acre and were sown on May 10, at the rate of two bushels per acre.

The advantage of early seeding with barley as with other grains was emphasized this year. All early sown barley escaped injury from frost and showed a good germination test in comparison with later-sown crops.

BARLEY—SIX-ROWED TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Date of Sowing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Nugent	Black clay loam.	May 10	53	Strong	3½	6,320	72	24	48
2	Mensury	" "	" 10	45	Medium	3	7,480	72	24	50
3	Oderbruch	" "	" 10	49	Strong	3½	5,840	70	..	48
4	Mansfield	" "	" 10	57	"	3	6,380	68	36	52
5	Stella	" "	" 10	51	Medium	2½	6,640	65	..	48
6	Claude	" "	" 10	49	Weak	2¾	6,000	60	..	48
7	Summit	" "	" 10	52	Medium	2½	6,060	57	24	50
8	Odessa	" "	" 10	47	Weak	3	6,480	56	42	42
9	Blue Long-head	" "	" 10	43	"	2½	6,320	53	36	46
10	Empire	" "	" 10	44	Strong	3	6,260	51	12	48
11	Albert	" "	" 10	54	Medium	2	5,840	48	36	49
12	Champion	" "	" 10	48	"	2½	4,980	48	36	42
13	Yale	" "	" 10	49	Strong	2½	5,460	47	24	50
14	Argyle	" "	" 10	44	Medium	3	6,320	47	24	48
15	Trooper	" "	" 10	48	"	2½	4,800	42	24	47

BARLEY—TWO-ROWED TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Date of Sowing.	Length of Straw, including Head.	Character of Straw.	Length of Head.	Weight of Straw.	Yield per Acre.		Weight per measured bushel after cleaning.
				In.		In.	Lbs.	Bush.	Lbs.	Lbs.
1	Clifford	Black clay loam.	May 10	50	Strong	4½	4,800	50	..	52
2	French Chevalier	" "	" 10	53	Weak	4	3,600	46	12	48
3	Gordon	" "	" 10	55	Medium	3¼	4,646	45	..	52
4	Canadian Thorpe	" "	" 10	42	"	4	3,840	45	..	42
5	Dunham	" "	" 10	58	"	3¼	4,260	43	36	51
6	Logan	" "	" 10	60	"	3	4,940	42	24	53
7	Standwell	" "	" 10	45	Weak	3	3,600	40	..	42
8	Sidney	" "	" 10	40	Medium	3¼	4,300	38	16	50
9	Invincible	" "	" 10	46	"	3½	4,000	37	24	48
10	Beaver	" "	" 10	66	"	3	3,840	36	42	50
11	Danish Chevalier	" "	" 10	57	"	4	4,460	32	24	44
12	Jarvis	" "	" 10	53	"	3	4,590	31	12	49
13	Swedish Chevalier	" "	" 10	46	Weak	4	3,920	28	36	38

EXPERIMENTS WITH PEAS.

Twenty varieties of peas were sown on May 25, at the rate of from two to three bushels per acre, according to the size of the seed. The soil was a clay loam which had been fall-ploughed and well disced in spring. The smoothing harrow followed the discs and the soil packer the smoothing harrow. All varieties made remarkable growth of vine, but owing to the short season, no varieties came to full maturity.

PEAS—TEST OF VARIETIES.

Number.	Variety.	Date of Sowing.	Character of Straw.	Length of Straw.	No. of pods on average Vine.	Degree of Maturity.
				Inches.		
1	Agnes	May 27	Coarse	....	5- 7	Late.
2	Archer	" 27	Medium	97	3- 5	Medium.
3	Arthur	" 27	Coarse	78	8-17	"
4	Blackeye Marrowfat	" 27	Fine	73	3- 4	Late.
5	Chancellor	" 27	"	78	5- 7	Medium.
6	Daniel O'Rourke	" 27	Coarse	72	4- 8	"
7	Early Britain	" 27	"	90	6	Early.
8	English Grey	" 27	Medium	84	8-16	Medium.
9	Gregory	" 27	Coarse	69	3- 5	"
10	Golden Vine	" 27	Fine	84	4- 5	Early.
11	Mackay	" 27	Coarse	50	4- 6	Late.
12	Nelson	" 27	"	78	5-11	Early.
13	Paragon	" 27	Medium	45	3-10	Medium.
14	Picton	" 27	"	72	4- 6	Late.
15	Prince	" 27	Coarse	72	5- 6	"
16	Prince Albert	" 27	Fine	78	4- 8	"
17	Prussian Blue	" 27	"	96	6	"
18	Victoria	" 27	"	78	4	"
19	White Marrowfat	" 27	"	76	2- 3	Very late.
20	Wisconsin Blue	" 27	"	84	5- 6	Late.

ALFALFA.

One acre of alfalfa was sown in May, without a nurse crop, on well worked, fall-ploughed stubble land, at the rate of 18 pounds of seed per acre. Soil supplied by Mr. W. H. Fairfield, Superintendent Experimental Farm, Lethbridge, from fields where alfalfa has become well establisded, was used to inoculate three-quarters of the acre, while one-quarter was left without treatment. The seed germinated well and made good growth during the season, being clipped back with the mower three times to promote root growth and to develop a large crown on the young plant. The plants growing on the inoculated soil showed a larger development of crown, and will thus be in a better position to come through the winter, and were also a richer colour.

A plot of Turkestan alfalfa was sown, but the seed failed to germinate. When the value of alfalfa as a fodder crop is fully appreciated, every effort will doubtless be made by the stockmen of this province to establish an acreage on their land. Difficulties may stand in the way of its successful introduction on first trials, but that success will be finally achieved there can be little doubt.

EXPERIMENTS WITH RED CLOVER.

Three acres of Red Clover were sown in early June with a shelter crop, clover seed being used at the rate of 8 lbs. per acre and oats for a shelter crop at the rate of 15 lbs. per acre. In July the shelter crop was cut back and left upon the ground. The clover seed germinated well, but did not appear as vigorous last fall as was expected. Neither seed nor soil was inoculated, however, and this may be necessary to insure a strong stand. This question will be made a matter of further investigation.

EXPERIMENTS WITH INDIAN CORN.

As may be judged from what has been already said regarding the season, the corn crop did not come to maturity. The twenty varieties under test had reached an average height of about four feet when frost on August 18, checked the growth and all varieties were ploughed under. At no time during last summer were the nights sufficiently warm to force a rapid growth of this crop.

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown. The soil was a heavy black clay loam. Two sowings of each sort were made, the first on June 10 and the second on June 24. The second sowing was attacked by gophers and cutworms and destroyed to such an extent that the value of any report of yields was destroyed. The results of the first sowing are given. The roots were harvested October 23. The yield has been calculated from the weight of roots gathered from two rows, each 33 feet long.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Sown.	Pulled.	Yield per Acre.	
				Tons.	Lbs.
1.	Hartley's Bronze	June 10....	October 23.	26	800
2.	Good Luck	" 10....	" 23.	22	1,408
3.	Kangaroo	" 10....	" 23.	22	1,408
4.	Skirvings	" 10....	" 23.	22	352
5.	Mammoth Clyde	" 10 ...	" 23.	22	352
6.	Hall's Westbury	" 10...	" 23.	20	1,184
7.	Jumbo	" 10....	" 23.	19	16
8.	Halewood's Bronze Top	" 10....	" 23.	17	848
9.	Perfection Swede	" 10 ..	" 23.	14	1,024
10.	Bangholm Selected	" 10....	" 23.	11	232
11.	Magnum Bonum	" 10....	" 23.	11	16
12.	Carter's Elephant	" 10....	" 23.	10	64

EXPERIMENTS WITH MANGELS.

Ten varieties of mangels were under test this season and it was proposed to sow two series of plots, one two weeks later than the other, but owing to the great amount of work under way during this first summer, only one sowing of mangels and one of carrots was made. The soil was a black clay loam that has been under crop for eleven years. Having been fall-ploughed, this land was harrowed in spring as early as possible to prevent undue loss of soil moisture. Weekly cultivation with a single horse cultivator was given until the middle of August. No manure was applied, but thorough cultivation was given all season and owing to an abundant rainfall, a fair crop was harvested.

The seed was sown on May 29, and the mangels harvested on October 21. Had it been possible to seed earlier, better results might have been obtained. The yield per acre has been calculated from the weight of roots gathered from two rows, each 33 feet long.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Sown.	Pulled.	Yield per Acre.	
				Tons.	Lbs.
1.	Giant Yellow Intermediate	May 29	October 21.	32	1,528
2.	Giant Yellow Globe	" 29	" 21.	28	1,552
3.	Half Sugar, White	" 29	" 21.	28	1,552
4.	Yellow Intermediate	" 29	" 21.	28	1,024
5.	Gate Post	" 29	" 21.	28	1,024
6.	Mammoth Red Intermediate	" 29	" 21.	22	1,936
7.	Selected Yellow Globe	" 29	" 21.	22	1,408
8.	Prize Mammoth Long Red	" 29	" 21.	20	1,184
9.	Crimson Champion	" 29	" 21.	20	1,184
10.	Perfection Mammoth Long Red	" 29	" 21.	19	1,600

EXPERIMENTS WITH CARROTS.

Six varieties of carrots were under test. The soil was a black clay loam and had been under cultivation for eleven years, and was prepared similarly to that for mangels. As with the mangels, only one sowing was made, the date being May 29. The rows were 30 inches apart; four rows of each variety were sown, and the results computed from the two centre rows, from which the roots were weighed for a distance of 33 feet. The carrots were pulled October 22.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Character of Soil.	Sown.	Pulled.	Yield per Acre.	
					Tons.	Lbs.
1	Improved Short White	Black clay loam.	May 29	Oct. 22	26	744
2	Ontario Champion	" "	" 29	" 22	16	680
3	Giant White Vosges	" "	" 29	" 22	16	680
4	Half Long Chantenay	" "	" 29	" 22	14	1,568
5	White Belgian	" "	" 29	" 22	14	982
6	Mammoth White Intermediate	" "	" 29	" 22	12	222

EXPERIMENTS WITH SUGAR BEETS.

Three varieties of sugar beets were under trial and were sown on soil as were the other roots, a black clay loam, prepared as for the other root crops. The growth of the beets was good, especially toward the latter part of the season. The seed was sown on May 29, and the crop harvested on October 21.

SUGAR BEETS—TEST OF VARIETIES.

Name of Variety.	Character of Soil.	Character of Growth.	1st Plot Sown.	1st Plot Pulled.	Yield per Acre.	
					Tons.	Lbs.
Wanzleben	Black clay loam.	Good	May 29	Oct. 21	18	960
French, very rich	" "	"	" 29	" 21	15	1,680
Vilmorin's Improved	" "	"	" 29	" 21	15	1,152

EXPERIMENTS WITH POTATOES.

The planting of potatoes was delayed owing to the lack of seed, which was received on June 15, and the potatoes were planted on that date. Growth was good but had not proceeded far when the plants were frozen. Seventeen varieties were tested and were planted in hills on clay loam, three feet apart each way, on fall-ploughed stubble land that was not manured. Digging was completed October 1. Under the unfavourable conditions referred to, the yields could not be expected to be large.

Number.	Name and Variety.	Total Yield per Acre.		Yield per Acre of Marketable.		Form and Colour.
		Bush.	Lbs.	Bush.	Lbs.	
1	Early Envoy	220	34	198	28	Long, pink and white.
2	Country Gentleman	215	7	195	45	" "
3	Everett	197	11	167	36	Oblong, red.
4	Pioneer	193	59	175	4	Flat, white.
5	Bovee	178	45	143	..	Long, rose.
6	State of Maine	178	37	160	34	Oval, pink and white.
7	Vermont Gold Coin	178	37	160	30	Flat, white.
8	Dreer's Standard	175	24	168	15	Oval, white to yellow.
9	Early Rose	149	46	112	20	Oblong, rose.
10	Holborn Abundance	139	15	118	14	Round, white.
11	British Queen	121	..	90	15	Long and round, white.
12	Canadian Beauty	117	55	100	14	Long and flat, pink.
13	Burnaby Mammoth	116	4	104	28	Oval and flat, red.
14	American Wonder	113	19	90	40	Long and flat, white.
15	Tabletalk	97	24	83	21	Flat and oval, white.
16	Ash Leaf Kidney	86	36	69	17	Long and round, white.
17	Dalmeny Beauty	74	16	57	54	Flat and smooth, white.

ORCHARD.

A large number of apple trees were planted last spring including standards, cross-breds and seedlings, totalling one hundred and fifty-two different varieties and selections. Plum and cherry trees of the hardier varieties were also set out and while nearly all these trees lived and made a strong growth, the heavy rains last fall prevented the wood from ripening as it should. We hope, however, to see a large percentage still alive next season.

SMALL FRUITS.

There was sent from the Central Experimental Farm a fine collection of small fruits including red, white and black currants, raspberries, gooseberries and strawberries. With the exception of the last named, for which cutworms displayed a special fondness, the large proportion grew well and will afford an abundance of material for future experimental tests.

FOREST AND ORNAMENTAL TREES AND SHRUBS.

Several thousand trees and shrubs of many varieties were planted, but a report as to their suitability to this climate cannot be made at present more than to say that a splendid growth was made last season. The large percentage of the trees planted were Manitoba Maple, Caragana, Cottonwood, Colorado Spruce and Balsam Fir, the hardiness and adaptability of which to the western provinces has already been fairly well proven. Many of these will be used for planting windbreaks and avenues on the Farm.

HORSES.

There are seven horses, including a young filly foaled in August, the property of the Experimental Farm. Four of these are work horses averaging in weight about 1,600 lbs. and are young and serviceably sound. The filly is out of one of the Clydesdale mares and gives promise of being a useful animal. The two remaining horses are used as drivers and for lighter farm work and average 1,200 lbs. in weight. They were bred by Rawlinson Bros., of Calgary, are four years old and make a team at once attractive and serviceable.

CATTLE.

Two Jersey cows are kept on the Farm and a calf is being reared. This stock is not intended for experimental work, but as a source of milk supply only. The country is, however, well adapted for live stock of all kinds and dairying is rapidly assuming considerable proportions. While many cattle have been raised and sold as beef in the days of the free range, the number is small in comparison with the possibilities of this country as a feeding and finishing centre. It is hoped that a trade with Britain in chilled meat may be one of the developments of the near future in order that the present feeders of cattle may receive the encouragement they deserve and recruits enlisted in this business.

CORRESPONDENCE.

The correspondence during the year has not been heavy. From November 16 till March 31, 404 letters were received and 322 despatched, not including circulars and bulletins.

MEETINGS.

I attended the convention of Institute Workers of Alberta, held in Calgary on January 4, and delivered an address. I also spoke at the Local Seed Fair at Edmonton on February 13 and 14, and at the Provincial Seed Fair at Lethbridge on the 18th, 19th, 20th and 21st of February. At the request of the secretary of the Alberta Fairs Association, I attended the annual meeting of that organization held at Calgary on the 18th and 19th of March, and addressed the delegates in attendance.

METEOROLOGICAL OBSERVATIONS FOR LACOMBE, ALBERTA.

Months.	Highest Temperature.	Lowest Temperature.	Total Rainfall.	Total Snowfall.	Total Sunshine.
1907.			Inches.	Inches.	Hours.
December	57·8	—18·1	None	3·75	82·0
1908.					
January	48·8	—20·1	None	2·00	117·54
February	55·6	—18·1	None	10·75	115·18
March	54·6	—17·6	None	10·625	141·00

I have the honour to be, sir,
Your obedient servant,

G. H. HUTTON,
Superintendent.

Spanish Chestnut in Fruit, Experimental Farm, Agassiz, B.C.

Photo by C. E. Saunders.

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EXPERIMENTAL FARM FOR BRITISH COLUMBIA.

REPORT OF THOMAS A. SHARPE, SUPERINTENDENT.

AGASSIZ, B.C., March 30, 1908.

To DR. WM. SAUNDERS, C.M.G.,
Director of Dominion Experimental Farms,
Ottawa.

SIR,—I have the honour to present my annual report of the work done on the Experimental Farm at Agassiz for the year ending March 31, 1908.

This has been rather an unfavourable year for farmers. The year began with considerable snow and cold high winds from the north, northwest and northeast, which continued during the whole of January and almost all of February and while the temperature did not at any time go very low, the snowfall, which for January amounted to twenty-four inches and for February six inches, did not go off, as the cold was unbroken until March. In March the snow began to melt but disappeared very slowly as the weather continued cold with northerly winds prevailing. On the 30th there was a light fall of one inch. April and May continued cold with northerly winds and a light rainfall which was very unfavourable for pastures, meadows, and for the germination of spring grains. Fruit trees were from two to three weeks later in coming into bloom than for several years and when they did bloom the weather was so cold and unfavourable that the fruit did not set freely especially on many varieties of the larger fruits. The dry, cool, backward weather continued until the beginning of June when it became warmer with showers of rain which, while it helped growing crops, was injurious to the sweet cherry crop which was then ripening and was unfavourable for curing the early crop of clover.

Corn, which up to July the first, had made but little progress, began to grow when the weather became more favourable, and grains, roots and late potatoes improved.

The showers were heavier and more frequent in August which was of great benefit to pastures, root crops and the second crop of clover. September was drier than usual with a good average of bright sunshine which enabled farmers to get their harvesting done in good condition, much of this work having been delayed by the frequent showers in August. October was a very fine month for all farm work the rainfall being only $\frac{3}{4}$ of one inch and the bright warm sunshine and dry air made saving of the root and potato crops and filling silos with corn very easy. November was dry and fine for the most part; the rainfall being only about average and confined to the last half of the month. The first signs of the coming winter was a fall of two inches of snow on the 24th; the lowest temperature during the month was 31 on the 27th. In December the rainfall was slightly over two inches, being much below the average. There was a fall of one inch of snow on the 31st and the lowest temperature during the month was 28 on the 19th. There was no trouble in ploughing, clearing land or doing any other farm work during this month as there were no severe frosts nor long continued rains.

On the whole, although the season has not been one of heavy crops, yet the yields have been fair and prices good and the weather generally favourable for all farm work.

FRUIT CROPS.

Although the spring was not favourable, yet on the whole the fruit crops were fairly good, and the bright sunny weather was very favourable for effective spraying, with the result that there was very little rot in some fruits and but a small proportion of apples injured with black scab.

MOUNTAIN ORCHARDS.

The apple crop on the trees on the mountain was fairly heavy and the fruit very free from blemishes, of good size and finely coloured. The crops of plums on the different benches was heavy, well developed and promising, as were the pears and a few peach trees, but as in former years the bears began taking the fruit before it was fully ripe and they secured most of the crop.

A select lot of seedling apple trees were planted on one of the benches and this year quite a number of the trees fruited. None of those specimens which matured proved large enough to be of value. Several of the trees had very handsome apples of fair quality and good keepers, but all were below medium size and not of sufficient merit to be worthy of propagation.

Of seedling pears, one, a cross between Bartlett and Kieffer, has fruited freely for three years and on further test may be found of value.

A considerable number of cherry seedlings have also fruited, three of the heart cherries are promising, being strong healthy growers, free producers with fairly large and well flavoured fruit, but like other cherries of the heart class are subject to splitting from damp weather, during the ripening of the fruit. Quite a number of the morello class also fruited but of those that have borne fruit this year the fruit is too small to be of value.

Quite a number of seedling plums have fruited, but although several have produced specimens of fair size and good quality, yet there are none of sufficient merit to be worthy of a place in the lists that already contain so many varieties of high quality.

These trees have been taken from the nursery at one year old and planted on the bench on land that could not be used for other crops, so that, although very little of real value has yet been secured, the work has been interesting and has involved but a trifling cost.

Ornamental trees and shrubs, although later than usual in coming out in leaf or in bloom, have been very thrifty and the bloom very fine. The long continued cold winter does not appear to have injured any of them.

The following list comprises some of the most satisfactory bloomers tested here: Forsythia viridissima, Rhododendrons, Azaleas, Kalmia latofolia, Viburnum plicatum, Lilacs, Hydrangea paniculata grandiflora, and Hydrangea Hortense.

The above list gives flowers from early in spring before the leaves expand until frosts come late in November. Of course roses should be in every flower garden, they are in such variety that every taste can be suited.

In trees with ornamental foliage, the copper beech and cut-leaved beech, Prunis Pissardi, Silver-leaved Box Elder, are all desirable. The double red and double white flowering thorn, and the red and white flowering Cornus are also very attractive.

For shade trees where there is abundance of room, the Sugar Maple, Schwedlers Maple, Reitenbacher Maple, the English Walnut, and the Japanese Walnut, all make very handsome vigorous trees.

Nut trees and shrubs.—The English, Siebold's, Heartshaped, and American Black Walnut, all fruited freely this year. The Spanish and Japanese Chestnuts bore sparingly and several of the varieties of Filberts fruited. Of the above the English and Siebold's Walnuts are the most desirable, as they make very handsome shade trees and commence to bear when quite young, the Siebold's being a regular and profuse bearer, the nuts growing in clusters of 6 to 12. Very few of the twenty-six varieties of Filberts under trial are productive enough to make them desirable. The Pearson's

Early Red is a strong bushy grower and a fair producer, and the nuts, although small, are finely flavoured. The Blue Jays are very numerous and troublesome and begin to carry off the nuts before they are fully matured. A large number of small sacks of nuts have been distributed to farmers throughout British Columbia, and many reports of success in growing them have been received.

DITCHING.

Owing to scarcity of labour, very little ditching has been done this year.

CATTLE.

Since my last annual report sixteen head of cattle have been sold, three bulls for breeding purposes and thirteen for beef, and the herd now numbers twenty-seven head, all in apparently the best of health.

SHEEP.

The flock of sheep, all pure-bred Dorset Horned, numbers eighteen ewes and ewe lambs, a stud ram and six wethers. Four rams have been sold at satisfactory prices, and three lambs killed by wild animals.

PIGS.

The stock of pigs at present consists of one registered Berkshire and ten pure-bred Yorkshires. A number of both breeds have been sold as breeders, and several to the butcher.

HORSES.

Two more of the horses originally bought when work on this farm began, having become too old to be of service, have been disposed of and a team of young horses bought in their place. The working force of horses consists of three teams of young geldings, one driving mare, and one old gelding.

FOWLS.

There are at present five pens of pure-bred fowls—Black Minorcas, Buff Plymouth Rocks, Buff Orpingtons, White Wyandottes and Rhode Island Reds. The last-named were hatched from eggs obtained last spring, some from Seattle and some from Quebec. All are fine specimens of the breed.

Of the other breeds, all of which we have had for some years, the Buff Orpingtons were the best layers last year and the birds are very fine and large, mature early and make good table birds. The Black Minorcas came second as layers, and the White Wyandottes third. The White Wyandottes mature early, but with us are not so large when mature as the Buff Orpingtons. The Buff Plymouth Rocks are a little later in maturing than the Buff Orpingtons and White Wyandottes, but are larger when mature than the White Wyandottes, and as layers are about the same. In most cases it is the strain as well as the care and feed, as much as the breed, which produces good or poor layers.

The fowls are kept penned with a yard attached to each pen, from January 1 to July 1, and they run at large the balance of the year. They are fed whole grain of mixed kinds, wheat, oats, peas and barley, preferably a larger proportion of wheat than of the other grains, and when penned they get cabbage heads and small potatoes boiled and mashed, with a little chop and sometimes milk all mixed together. They always have fresh water, grit, and broken clam shells before them.

The hen-house is kept clean by spraying with whitewash several times a year, the pens are cleaned out once a week, and fresh straw or chaff put on the floors, three

or four inches deep. The roosts are frequently washed with Cooper's Sheep Dip and the hens and pens are almost free from insects of any kind. Their yards are dug up frequently and sometimes lime is scattered on the ground before digging to keep it pure and clean.

There has been no sickness of any kind among the fowls except a very few cases of rheumatism, induced by the wet weather in spring and autumn. We find dampness much more trying to the fowls than frosty weather.

BEES.

The season was a poor one for honey but we only lost one swarm during the winter. Nine swarms are being wintered and all of these have a sufficient store of honey to carry them through until spring.

EXPERIMENTS WITH FALL WHEAT AND RYE.

Six varieties of fall wheat and five of rye were sown in plots on October 20. The land for these plots had given two cuttings of clover and as soon as the second crop was cut, the land was ploughed and disced and was repeatedly harrowed and disced until it was in a fine condition for the seed. In most of the plots the yield has been pretty good and there has been no rust or smut on any of them. The size of the plots was one-tenth acre each and the seed was sown at the rate of one and one-half bushels per acre.

FALL WHEAT—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
	Fall Wheat.			Inches.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Red Velvet Chaff.....	July 24.	277	40	Stiff......	4	Beardless.	6,910	36	40	61
2	Turkey Red..........	″ 26.	279	43	″	4	Bearded..	5,820	32	40	62
3	Abundance...........	″ 27.	280	47	″	3½	Beardless.	5,640	27	..	60
4	Dawson's Golden Chaff.	″ 23.	276	44	″	3½	″ .	5,360	26	..	60½
5	American Banner	″ 24.	277	44	″	3	″ .	5,160	22	40	61
6	Kharkov	″ 24.	277	41	Weak	2½	″ .	4,820	18	40	60
	Fall Rye.										
1	Emerald	July 26	279	60	Stiff......	6	Bearded..	6,460	37	48	57
2	Western....	″ 27.	280	61	″	6½	″ ..	6,200	36	24	57½
3	Giant...............	″ 27.	280	61	″	6	″ ..	5,900	32	8	56½
4	Thousandfold........	″ 26.	279	60	″	6½	″ ..	4,650	29	16	56
5	Mammoth........	″ 26.	279	62	″	6	″ ..	4,700	23	2	56½

SPRING WHEAT.

No tests were made with Spring Wheat this year and as no Spring Wheat has been grown in this valley for two years it is to be hoped that the midge has been starved out. Although no wheat for milling is grown hereabouts, yet it is a fairly profitable crop to grow in a rotation as it usually yields well and owing to the demand for it for chicken feed the price is always good.

EXPERIMENTS WITH OATS.

Thirty-one varieties of oats were sown in the uniform test plots this year. They were sown April 19, on plots one-fortieth of an acre each, on sandy loam that had been in corn in 1906 and was ploughed in the fall and disced and harrowed several times before the seed was sown. The seed as in previous years was treated with formalin and sown at the rate of two and one-half bushels, eighty-five pounds per acre. The seed was very late in starting owing to the dry cold conditions of the soil, but grew rapidly and the yields were fairly good and the grain bright and plump. There was no rust or smut.

OATS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	Number of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Kind of Head.	Weight of Straw.	Yield per Acre.		Weight per Bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Danish Island	Aug. 10.	113	46	Strong.	10	Branching	6,070	91	6	35½
2	Abundance	" 5.	108	48	"	11	"	6,550	84	22	36
3	Irish Victor	" 6.	109	47	"	10	"	5,860	84	8	36
4	American Beauty	" 5.	108	46	"	11	"	5,310	81	26	35
5	Golden Giant	" 10.	113	44	"	9	Sided.	5,100	78	4	36
6	White Giant	" 7.	110	40	"	9	Branching	4,820	76	26	37
7	Swedish Select	" 6	109	47	"	10	"	5,360	71	16	35½
8	Thousand Dollar	" 10.	113	41	"	9	"	5,100	71	4	34½
9	Milford White	" 10.	113	42	"	9	Sided.	5,340	70	32	34½
10	Kendal Black	" 10.	113	40	"	10	"	5,560	68	16	35½
11	Wide Awake	" 9.	112	42	"	9	Branching	5,330	68	10	36
12	Golden Fleece	" 7.	110	46	"	10	"	6,100	67	22	34½
13	Kendal White	" 10.	113	48	"	11	Sided.	5,720	66	32	35
14	Tartar King	" 5.	108	42	"	10	"	5,110	66	12	35½
15	American Beauty	" 5.	108	46	"	11	Branching	5,300	66	..	34½
16	Columbus	" 7.	110	42	"	10	"	4,860	65	14	35
17	Goldfinder	" 7.	110	42	Medium.	8	Sided.	4,780	64	32	34½
18	Joanette	" 5.	108	38	"	9	Branching	4,849	66	..	35
19	Improved American	" 8.	111	48	Strong	9	"	4,880	63	12	35
20	Sensation	" 10.	113	40	Medium.	9	"	4,360	62	26	34½
21	Siberian	" 8.	111	44	Strong	10	Sided.	4,450	61	8	35½
22	Banner	" 8.	111	44	"	9	Branching	4,500	60	30	35
23	Twentieth Century	" 5.	108	40	Medium.	10	"	4,160	59	28	34½
24	Golden Beauty	" 9.	112	42	Strong	9	"	4,460	59	18	35
25	Improved Ligowo	" 9.	112	42	"	9	"	4,300	58	30	34½
26	Virginia White	" 3.	106	49	"	9½	"	4,600	58	16	35½
27	American Triumph	" 7.	110	47	"	10	"	4,150	57	24	36
28	Pioneer	" 12.	115	46	"	11	"	4,400	57	4	34½
29	Black Beauty	" 6.	109	46	"	10	"	4,180	56	26	35½
30	Lincoln	" 7.	110	46	"	10	"	4,250	54	22	35
31	Storm King	" 3.	106	48	"	11	Sided.	4,320	54	2	34
32	Bavarian	" 12.	115	46	"	11	Branching	4,460	50	..	34

EXPERIMENTS WITH BARLEY.

The trial plots of barley consisted of 15 varieties, of six-rowed and thirteen of two-rowed. They were sown on April 18 on a sandy loam which had had a crop of clover grown on it every third year since 1891, and a heavy aftermath turned under for a crop of corn, roots or peas, followed by a grain crop and seeded to clover. This course has brought up a rather poor sandy soil to a fairly fertile loam with a good supply of humus which carries the crop over any ordinary drought without serious injury. The size of the plots was one-twentieth of an acre, and the seed was used in the proportion of two bushels per acre.

SIX-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Length of Head.	Weight of Straw and Grain.	Yield per Acre.		Weight per Measured Bushel.
				Inches.	Inches.	Lbs.	Bush.	lbs.	Lbs.
1	Empire	July 30..	103	40	4	5,700	55	..	49½
2	Yale	" 30..	103	43	3	5,460	54	40	49
3	Albert	Aug. 3..	107	43	2½	5,510	50	40	48½
4	Mansfield	" 2..	106	40	2½	4,980	50	10	49
5	Argyle	" 1..	105	44	3½	5,140	48	46	49½
6	Trooper	" 2..	106	44	3	5,320	48	26	48½
7	Mensury	July 30..	103	42	3	5,040	45	10	49
8	Oderbruch	" 26..	99	43	3	4,890	43	26	49½
9	Claude	" 30..	103	40	2½	4,940	42	44	48½
10	Summit	Aug. 5..	109	44	3	5,280	42	24	48
11	Odessa	" 3..	107	41	3	5,110	42	4	48½
12	Champion	July 27..	100	43	3	5,240	41	42	48
13	Blue-Longhead	Aug. 3..	107	42	4	5,430	40	..	49¾
14	Stella	" 5..	109	40	3	5,660	39	8	49
15	Nugent	" 3..	107	36	2	4,180	38	16	48½

All these barleys grew strong and stood up well..

TWO-ROWED BARLEY—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Straw.	Length of Head.	Weight of Straw and Grain.	Yield per Acre.		Weight per Measured Bushel.
				Inches.		Inches.	Lbs.	Bush.	lbs.	Lbs.
1	Standwell	Aug. 7...	111	40	Strong ...	3	6,100	57	24	49½
2	Dunham	" 5...	109	44	" ...	3½	6,300	56	12	50
3	Danish Chevalier	" 6...	110	41	" ...	4	5,960	53	16	49
4	Sidney	" 6...	110	41	" ...	4	5,800	52	24	48½
5	Canadian Thorpe	" 5...	109	42	" ...	3	5,940	48	36	49½
6	Invincible	" 5...	109	38	Medium..	3	5,210	48	16	48
7	Gordon	" 3...	107	40	Strong ...	3½	5,480	47	24	49
8	Clifford	" 1...	105	44	" ...	3½	5,320	42	44	48¾
9	Beaver	" 3...	107	44	" ...	3½	5,190	42	34	49
10	Swedish Chevalier	" 6...	110	48	" ...	4½	5,240	42	24	49
11	French Chevalier	" 5...	109	40	" ...	4	4,780	41	32	48½
12	Jarvis	" 7...	111	42	" ...	4	4,960	40	..	48
13	Logan	" 3...	107	40	" ..	4	4,850	39	28	48½

EXPERIMENTS WITH PEAS.

Twenty varieties of peas were sown in the test plots. The soil was a sandy gravelly loam which was in clover the year previous. The clover crop was a good one, two heavy crops were cut and a strong growth of aftermath turned under late in the fall. It was disced early in spring and repeatedly harrowed, and the seed sown April 18. The large varieties were sown at the rate of three bushels, 180 pounds per acre, the smaller sorts at the rate of two and one-half bushels, 150 pounds per acre.

PEAS—TEST OF VARIETIES.

Number.	Name of Variety.	Date of Ripening.	No. of Days Maturing.	Length of Straw.	Character of Growth.	Length of Pod.	Size of Pea.	Weight of Straw.	Yield per Acre.		Weight per bushel.
				In.		In.		Lbs.	Bush.	Lbs.	Lbs.
1	Chancellor	Aug. 8..	112	50	Medium..	2½	Small	4,600	52	..	62
2	Nelson	" 14..	118	52	Strong ...	3	Medium..	4,840	50	..	61
3	Golden Vine	" 12..	116	54	Medium..	2½	Small	4,970	48	..	62½
4	Archer	" 14..	118	56	Strong ...	3	Large	5,210	47	20	61¾
5	Early Britain	" 7..	111	50	" ...	3	Medium..	4,940	47	10	62
6	Arthur	" 12..	116	50	"	2½	Large	4,680	46	50	61½
7	Wisconsin Blue	" 8..	112	56	" ..	3	Small	4,780	46	40	62½
8	Black Eye Marrowfat	" 13..	117	66	"	3½	Large	5,340	46	20	61¾
9	Paragon	" 14..	118	60	"	3½	"	5,120	44	..	61
10	Prince	" 17..	121	42	"	3	"	4,480	43	40	61
11	Agnes	" 14..	118	58	" ...	3	" ...	5,330	43	20	62
12	Gregory	" 10.	114	52	" ...	2½	Medium..	4,760	43	..	61½
13	Picton	" 14..	118	54	"	3	" ..	4,490	42	..	63
14	White Marrowfat	" 14..	118	53	"	3	Large	4,220	42	10	62
15	English Grey	" 13..	117	51	" ...	3	Medium..	4,530	41	20	62
16	Prince Albert	" 12..	116	50	"	3	Small	4,420	40	40	63½
17	Mackay	" 14..	118	60	"	3	Medium..	5,320	40	..	61½
18	Victoria	" 13..	117	56	" ...	3	" ..	5,190	38	..	61
19	Prussian Blue	" 7..	111	50	"	2½	" ..	4,680	36	20	62
20	Daniel O'Rourke	" 6..	110	56	"	2	Small	5,130	34	..	63

EXPERIMENTS WITH INDIAN CORN.

Twenty varieties of Indian Corn grown for ensilage were planted May 25 on a clover sod ploughed early in April and harrowed repeatedly to a fine seed bed. The spring was dry and cold, and very unfavourable for corn up to July 1. The growth was rapid in July and August, but ears did not come to maturity on the coarser stronger growing varieties. The Yellow Canada Flint does not grow so many tons per acre, but on account of maturing in a shorter season gives a better crop of ripened ears and makes much better ensilage than some others. Harvested October 12 and 15.

INDIAN CORN—TEST OF VARIETIES.

Number.	Name of Variety.	Leafiness.	When Tasselled.	In Silk.	Character of Growth.	Early Milk.	Late Milk.	Condition when cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
									Tons.	Lbs.	Tons.	Lbs.
1	Eureka	Very...	Aug. 15	Oct. 12	Strong .	....	....	In silk......	22	220	21	900
2	Cloud's Early Yellow..	" ...	" 16	Sept. 18	" ..	Oct. 12	....	Early milk..	18	1,620	20	590
3	Compton's Early.	" ...	" 12	Aug. 31	" ..	Sept. 8	Oct. 12	Late milk ..	17	1,200	14	1,920
4	Champion White Pearl..........	Medium	" 8	" 24	" ..	" 8	....	" ..	17	320	16	1,110
5	Wood's Northern Dent..........	" ..	" 26	Sept. 26	" ..	....	.....	Early milk..	17	210	18	80
6	Giant Prolific Ensilage..........	Very...	" 30	" 20	" ..	....	....	Ears formed	17	100	13	1,280
7	King Philip	Medium	" 14	" 3	" ..	Sept. 22	......	Roasting ear	16	1,000	13	1,720
8	Pride of the North	" ..	" 23	" 6	" ..	....	.....	Early milk..	16	780	13	570
9	Early Mastodon..	" ..	" 24	" 26	" ..	....	.... .	" ..	15	1,020	14	600
10	White Cap Yellow Dent..........	" ..	" 22	" 10	V strong	Sept. 26	... .	" ..	15	580	14	270
11	Selected Leaming	" ..	" 16	Aug. 30	Strong .	" 22	....	" ..	14	1,480	13	1,060
12	Superior Fodder..	" ..	" 23	Sept. 10	" ..	....	....	Ears formed	14	820	13	1,610
13	Angel of Midnight	" ..	" 20	" 1	" ..	Sept. 20	....	Early milk..	14	600	14	1,820
14	Longfellow	" ..	" 14	" 10	" ..	" 22	....	Late milk...	13	1,280	16	1,000
15	Early Butler.....	" ..	" 18	" 1	" ..	" 14	....	Early milk..	11	1,760	11	440
16	Salzer's All Gold.	" ..	" 26	" 30	" ..	....	....	In silk......	11	1,320	12	310
17	Mammoth Cuban	" ..	" 26	" 20	" ..	.. ....	.....	Early milk..	11	1,210	10	570
18	North Dakota White.........	" ..	" 18	" 4	" ..	Sept. 26	....	" ..	11	440	11	1,760
19	Red Cob Ensilage	" .	" 12	Aug. 30	" ..	" 6	......	Late milk...	11	330	8	830

INDIAN CORN SOWN AT DIFFERENT WIDTHS BETWEEN ROWS.

The same varieties were used in this test as last year. These plots were sown alongside of and under the same conditions as the other test plots. The gross yield is greater in the plots which are planted close together, but the corn is never so mature nor the ears so large and well filled as at the wider distances. There does not appear to be any advantage in this respect in any greater distance apart than three feet, while there is a considerable loss in gross yield.

INDIAN CORN—TEST OF CORN AT DIFFERENT DISTANCES APART.

Number.	Name of Variety.	Distances between Rows.	Height.	Condition when Cut.	Weight per Acre grown in Rows.		Weight per Acre grown in Hills.	
		Inches.	Inches.		Tons.	Lbs.	Tons.	Lbs.
1	Champion White Pearl.......... ...	21	80	Early milk..	17	1,450	16	810
	" "	28	81	" ..	17	930	16	1,660
	" "	35	84	" ..	17	1,760	17	870
	" "	42	84	Roasting ear	18	680	18	..
2	Selected Leaming.	21	78	Early milk..	15	920	14	1,980
	"	28	80	" .	15	970	15	1,180
	"	35	80	" ..	14	120	13	580
	"	42	82	Roasting ear	14	1,700	14	1,890
3	Longfellow......	21	73	Early milk..	14	1,600	14	660
	"	28	73	" ..	14	300	14	1,700
	"	35	74	" ..	14	1,370	15	760
	"	42	76	" ..	14	1,900	14	1,420

EXPERIMENTS WITH TURNIPS.

Twelve varieties of turnips were sown in the test plots this year. The soil was a sandy clay loam which had been manured in the fall of 1906 with about 12 tons per acre of barnyard manure spread on an inverted clover sod and worked with disc and drag until thoroughly mixed with the soil, and harrowed every few days from as early as it was fit to work until the seed was sown. The soil was in fine condition when the seed was sown, but owing to dry weather the young plants were long in coming up and developed very slowly until the rains began in autumn, then they matured rapidly and gave a fair yield and the quality was very good.

Two sowings were made of each sort, the first on May 17, the second on May 31, and the roots from both sowings were harvested on November 7. The yield per acre has been calculated from the weight obtained from two rows, each 66 feet long.

Two of the best varieties so far tested are the Selected Purple Top and Carter's Elephant. These two varieties when well grown are uniform in shape, fairly even in size, with small tops and top roots.

TURNIPS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre.							
		1st Plot.				2nd Plot.			
		Tons.	Lbs.	Bush.	Lbs.	Tons.	Lbs.	Bush.	Lbs.
1	Jumbo	18	1,752	629	12	15	323	505	28
2	Mammoth Clyde	17	1,772	596	12	16	76	534	36
3	Bangholm Selected	17	384	573	4	15	228	503	48
4	Hartley's Bronze	16	76	534	36	15	1,680	528	..
5	Hall's Westbury	15	1,680	528	..	14	1,172	486	12
6	Carter's Elephant	15	1,614	526	54	13	1,456	457	36
7	Kangaroo	15	1,416	523	36	14	1,304	488	24
8	Magnum Bonum	15	360	506	..	13	1,192	453	12
9	Skirving's	14	1,172	486	12	14	116	468	36
10	Perfection Swede	14	776	479	36	14	1,964	499	24
11	Halewood's Bronze Top	13	1,984	466	24	13	664	444	24
12	Good Luck	13	1,324	455	24	15	724	512	04

EXPERIMENTS WITH MANGELS.

The soil on which these roots were sown was a light clay loam which had been manured at the rate of 12 tons of farm-yard manure per acre during the winter previous, and this was thoroughly cut up and worked into the soil as there had been a heavy clover aftermath turned under, and the manure worked into the surface so thoroughly that it almost disappeared, the land was in good condition, but the cold dry weather for such a long period during and after seeding prevented a free germination of the seed so that the stand was uneven, and the dry summer was against a free growth and the crop was lighter than expected, but the roots were firm, crisp and even.

Two sowings were made of each sort, the first on May 1, the second on May 15 and the roots from both were harvested on November 7 and 8. The yield per acre has been calculated from the weight of roots obtained from two rows, each 66 feet long.

The following varieties are perhaps the best of all those so far tested: Mammoth Long Red, Giant Yellow and Intermediate. The long Red Mangels are good croppers and when well grown are crisp and brittle and if not handled carefully in harvesting and storing, may get broken which sometimes induces decay.

MANGELS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	Lbs.	Bush.	Lbs.	2nd Plot. Tons.	Lbs.	Bush.	Lbs.
1	Half Sugar White	25	160	836	..	20	788	679	48
2	Perfection Mammoth Long Red	23	1,520	792	..	15	1,944	532	24
3	Giant Yellow Intermediate	22	1,352	739	12	20	1,844	697	24
4	Gate Post	19	1,336	655	36	13	1,984	466	24
5	Prize Mammoth Long Red	18	1,356	622	36	19	1,336	655	36
6	Selected Yellow Globe	18	960	616	..	20	1,184	686	24
7	Giant Yellow Globe	15	1,284	521	24	15	898	514	58
8	Crimson Champion	14	512	475	12	13	928	448	48
9	Yellow Intermediate	13	400	440	..	13	136	435	36
10	Mammoth Red Intermediate	12	1,212	420	12	12	1,872	431	12

EXPERIMENTS WITH CARROTS.

Six varieties of field carrots were sown in the test plots this year, two sowings of each variety were made. The first series of plots were sown May 1 and the second on May 15. The soil was a free sandy loam which had been ploughed in the previous autumn and harrowed to start any seeds that would grow and harrowed again in April several times and was in fine tilth when the seed was sown. The stand was pretty even and notwithstanding the rather unfavourable season the yields have been fairly heavy.

The two varieties which have succeeded best here are Ontario Champion and the Improved Short White, they are as a rule very uniform in size and very smooth with small tops. The roots from both sets of plots were harvested November 7.

The yield per acre has been ascertained from the weight of roots gathered from two rows, each 66 feet long.

CARROTS—TEST OF VARIETIES.

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons.	lbs.	Bush.	lbs.	2nd Plot. Tons.	lbs.	Bush.	lbs.
1	Ontario Champion	39	1,936	1,312	16	38	32	1,267	12
2	Giant White Vosges	36	1,524	1,225	24	35	1,412	1,190	12
3	White Belgian	31	832	1,047	12	32	1,340	1,890	..
4	Improved Short White	30	1,644	1,027	24	31	1,228	1,053	48
5	Half Long Chantenay	24	1,500	825	..	23	1,652	794	12
6	Mammoth White Intermediate	23	596	776	36	22	452	740	52

SUGAR BEETS.

Only three varieties of sugar beets were sown in the variety test plots this spring. These were sown alongside of the carrots, and the soil conditions and treatment was the same. Two sowings were made, the first on May 1 and the second on May 15. As in most of the other crops, the earliest sown gave the best yields. All were harvested November 7. The yield per acre was calculated from the weight of roots gathered from two rows, each 66 feet long.

Sugar Beets—Test of Varieties

Number.	Name of Variety.	Yield per Acre. 1st Plot. Tons	lbs.	Bush.	lbs.	2nd Plot. Tons.	lbs.	Bush.	lbs.
1	Vilmorin's Improved....	16	340	539	..	14	775	479	35
2	Klein Wanzleben............................	12	585	409	45	10	1,945	365	45
3	French Very Rich............	11	935	382	15	10	295	338	15

POTATOES.

Twenty-nine varieties were planted May 14, four rows, each one hundred feet long, and the yield per acre was computed from the crop of 66 feet of the two middle rows. The soil was a sandy loam that had received a dressing of about twelve tons of farmyard manure for the previous crop, which was corn and vegetables. The drills were 30 inches apart, and the sets about 1 foot apart in the row. The seed was cut to two eyes each. The yield, as will be seen in the following tables, has been fairly good, the tubers were fairly even and smooth and the table quality excellent. They were dug September 25 and 26.

Potatoes—Test of Varieties.

Number.	Name of Variety.	Rot.	Size.	Total Yield per Acre. Bush.	Lbs.	Yield per Acre. Marketable. Bush.	Lbs.	Unmarketable. Bush.	Lbs.	Description of Variety.
1	Morgan Seedling...	Very little..	Very even	598	24	550	54	47	30	Oval, red.
2	Early Rose........	None.......	"	598	24	538	44	59	40	" rose.
3	Holborn Abundance	"	"	563	12	518	12	45	00	" white.
4	Uncle Sam	Very little..	"	558	48	540	18	33	30	" "
5	Sabean's Elephant..	None.......	"	554	24	526	44	27	40	Long "
6	Vermont Gold Coin	A little.....	"	554	24	499	00	55	24	Oval "
7	Late Puritan	Very little..	"	552	12	497	12	55	00	" "
8	Empire State......	A little.....	"	545	36	500	00	45	36	" "
9	Early White Prize.	Very little..	Uneven........	541	12	476	16	64	56	" "
10	Rochester Rose....	" .	Even..........	523	36	482	40	41	56	Long, red.
11	Country Gentleman	Considerable	"	523	36	460	48	62	48	Oval "
12	Dreer's Standard...	None. ...	Uneven.......	510	24	459	09	61	15	" white.
13	State of Maine.....	Considerable	"	492	48	419	18	73	30	" "
14	Carman No. 1. .. .	A little.....	"	479	36	412	36	67	00	" "
15	Burnaby Mammoth.	Very little..	Even and smooth	475	12	447	42	28	30	Long, red.
16	Everett...........	" ..	" " .	457	36	430	00	27	36	" pink.
17	Reeve's Rose	" ..	" " .	453	12	416	57	36	15	" rose.
18	American Wonder..	None.......	Very even......	444	24	422	00	22	24	" white.
19	Dooley.	A little. ...	"	444	24	426	48	17	36	Round "
20	Early Envoy.... ..	Very little..	"	435	36	418	12	17	24	Oval, pink.
21	Ashleaf Kidney ...	" ..	"	431	12	405	42	25	30	Oblong, white.
22	Bovee.	None......	"	413	36	380	36	33	00	Oval, pink.
23	Neil's Shortseason .	Considerable	Uneven...	409	12	368	12	41	00	Round, pale pink
24	Irish Cobbler......	None......	Very even......	396	00	364	30	32	30	Round, white.
25	Canadian Beauty...	Considerable	"	389	24	334	54	54	30	Oval, pink.
26	Vick's Extra Early.	None......	"	378	24	359	24	19	00	"
27	Dalmeny Beauty...	Considerable	"	334	24	284	24	50	00	Oval, white.
28	Maule's Thoroughbred......	None.......	"	316	48	291	48	25	00	" pink.
29	Money Maker	"	" ...	316	48	269	48	47	00	" white.

SUMMARY OF CROPS.

The hay crop in this lower Fraser Valley was, owing to the cool, dry spring, somewhat lighter than usual. Our hay is a mixture of red clover, orchard grass, and Italian rye grass. As these fodder plants mature pretty well together, the quality of the hay, when cured under favourable conditions, is very good, and if the weather is too showery to cure hay they make a better quality of ensilage than corn in this climate, where the seasons are not hot enough to properly mature the large growing varieties, and in most seasons three crops of clover may be cut, which will total more than we can raise per acre of corn, and as no special machinery is needed to cut the clover and as it does not need cultivation, it is much cheaper per ton for silage than corn .

	Tons.	Lbs.	Tons.	Lbs.
Hay	48	800		
Ensilage clover	54	...		
Corn	43	...		
Total	—	——	145	800
Turnips	37	1,800		
Mangels	12	700		
Carrots	5	1,200		
Potatoes	4	1,000		
Total	—	——	60	700

Grain (threshed)—

	Bush.	Lbs.
Fall wheat	53	..
Rye	7	36
Peas	174	30
Barley	48	..
Oats	260	..
Mixed grains	616	..

SAMPLES DISTRIBUTED.

	Packages.
Scions and cuttings	187
3 lb. samples potatoes	10
3 lb. samples oats	106
3 lb. samples peas	95
3 lb. samples barley	92
3 lb. samples wheat	25
3 lb. samples corn	36
Nuts, trees, seeds and bulbs	393
Total	944

CORRESPONDENCE.

Letters received	4,015
Letters despatched	3,809

GARDEN VEGETABLES.

Table Beets—Sown April 18.

Early Blood Turnips.—Fit for table July 18, roots very even in growth, crisp, sweet and of pleasant flavour.

Egyptian.—Fit for table July 20, a very uniform grower, very crisp, sweet and of excellent quality.

Nutting's Dwarf Improved.—Fit for table July 28, fine flavour, crisp and sweet, but not a regular or uniform grower.

Long Smooth Blood Red.—Fit for table September 18, roots long, smooth and uniform in size, very dark colour, crisp and sweet, very good.

Beans—Planted April 20.

Extra Early Valentine.—Fit for table June 20, pods of medium length, crisp, pleasant flavour, very productive.

Dwarf Extra Early.—Fit for table June 20, pods 2½ to 3 inches long, and of good quality, but not very productive.

Emperor of Russia.—Fit for table July 3, very dwarf and not very productive pods 3 to 4 inches long and of very fine flavour.

Dwarf Wax.—Fit for table July 18, plants dwarf and not productive, pods 2 to 4 inches long, round, crisp, stringless and fine in quality.

Davis White Wax.—Fit for table July 19, plants vigorous and very productive, pods 3 to 5 inches long.

Black Seeded Wax.—Fit for table July 24, pods 3 to 5 inches long, round, plump. crisp and of fine quality, plants very productive.

Parsnips—Sown April 30.

Sutton's Student.—Fit for table in September, sweet, pleasant flavour, very good.

Hollow Crown.—A strong grower of very fine quality.

Cabbage.

Sown in beds in the open garden April 29, and transplanted June 9.

Early Paris Market.—Fit for table July 24, heads of medium size, rather loose, but crisp and sweet and of fine flavour.

Early Jersey Wakefield.—Fit for table July 29, heads of medium size, firm and compact, crisp, very tender and delicate in flavour.

Early Savoy.—Fit for table July 30, heads of medium size, round and solid, very crisp and sweet, very fine flavour.

Late Flat Dutch Drumhead.—A late fall and winter variety, a very sure header with heads broad, flat and solid, an excellent keeper.

Fottler's Improved Drumhead.—A winter variety, a sure header and uniformly large solid heads, of fine keeping and table qualities.

Green Globe Savoy.—A good fall and winter cabbage, a very uniform header, heads of medium size, very solid, and not liable to crack with September rains, a good keeper and fine table winter cabbage.

Cauliflower—Sown April 29; transplanted June 8.

Selected Extra Early Dwarf Erfurt.—Fit for table July 24, heads small but very solid, crisp, white, and of very fine quality.

Early Snowball.—Fit for table July 29, heads of medium size, very firm and white, very sweet and delicate in flavour, quality very good.

Walcheren White.—Fit for table August 16, heads large, firm and white, very sweet, of fine flavour and keeps firm a long time.

Brussels Sprouts.

Sown April 29, transplanted June 3, a very strong, vigorous grower, heads firm and of a very pleasant, mild flavour.

Carrots—Sown April 11.

Early Scarlet Horn.—Fit for table June 22, small, smooth, crisp and of very fine quality.

Half Long Scarlet Nantes.—Fit for table July 18, smooth, crisp, juicy, sweet, very high coloured and of fine quality.

Half Long Danvers.—A very fine cropper, and a good winter keeper, one of the best for the table.

Onions—Sown April 19.

Large Red Wethersfield.—Large, solid, early, and a sure bottoming sort, with a very small per cent of coarse necks; quality good, and an excellent keeper.

Yellow Globe Danvers.—A sure cropper and a very fine even bulb; quality mild and sweet; a very profitable variety.

Prize Taker Red Globe.—A large, handsome onion, of mild flavour and good quality, but with a large per cent of coarse necks.

Paris Silverskin.—Early, and fine for pickling.

Garden Squash—Planted May 8.

White Bush Scalloped.—Vines bushy and productive; squash 6 inches to 8 inches in diameter; fit for table August 14.

Giant Crookneck.—Vines productive; squash fairly large and very good quality; fit for table August 18.

Orange Marrow.—Vines long and productive; squash 10 inches to 14 inches long; thick-fleshed and very fine for table use.

Perfect Gem.—Vines very long and very productive; squash globular, 4 inches to 5½ inches in diameter; flesh thick and of very fine quality; a very good keeper.

Essex Hybrid.—Vines strong and very productive; squash thick fleshed and of very good flavour.

Delicata.—Vines of strong growth and fairly productive; squash of medium size; flesh thick and very good flavour; a very good late summer and fall variety.

Hubbard, Golden Hubbard and Warty Hubbard, have all the same characteristics of growth of vines, shape, quality and appearance of squash, when well grown, and ripened all are very fine for table.

Sibley.—Vines long and moderately productive; squash of medium size; green, hard shell; flesh thick and very fine, and a very good winter keeper.

Delicious.—Vines strong and productive; flesh thick and very superior, being dry, sweet, and very delicate in flavour when cooked; an excellent winter variety.

Fordhook.—Vines long and productive; squash oblong and flesh very thick, and when cooked is dry, sweet and good; a good keeper.

Garden Peas—Sown April 18.

Extra Early.—Fit for table June 22; pods of fair length and well filled, and the vines were very well podded.

Thos. Laxton.—Fit for table June 24; straw 22 inches to 30 inches long, and well laden with pods; peas of very fine quality.

Nott's Excelsior.—Fit for table June 26; vines 15 inches to 18 inches long, well laden with medium to large pods.

Alaska.—Fit for table June 29; vines 24 inches to 30 inches; pods long and very well filled with large peas of very fine quality.

Gradus.—Fit for table July 2; peas large and very superior in quality; pods long and well filled.

Champion of England.—Fit for table July 9; straw very long and productive; pods long and well filled with very fine flavoured peas.

LETTUCE—SOWN April 18.

Cabbage Lettuce, Big Boston.—A very vigorous grower; leaves thin, crisp and very good; fit for table May 28.

Black Seeded Simpson.—Fit for table May 28; leaves very large, thin, firm, crisp; of very fine quality.

All the Year Round.—Fit for table June 6; crisp, sweet and of fine quality; lasting a long time fit for use.

Wheeler's Tom Thumb.—Fit for table June 14; a crisp, close growing, fine flavoured variety.

TABLE TURNIPS—SOWN April 19.

Early White Milan.—Fit for table June 7; very crisp; sweet and good; grows very rapidly, and remains fit for table a long time.

Early White Strap Leaved.—Fit for table June 14; crisp, very white.

RADISHES—SOWN April 18.

Early White Tipped Turnip.—Fit for table May 23; crisp and sweet.

Olive Scarlet.—Fit for table May 26; crisp; very fine quality; sweet.

Scarlet Turnip.—Fit for table May 28; crisp and sweet, but soon goes soft.

Long Black Spanish.—Sown August 2; fit for table October 18; rather tough and astringent, and not of high quality.

APPLES.

The late cold spring was unfavourable for the apple crop. With severe northerly winds and cold nights the crop was not a heavy one and many varieties failed to produce any fruit.

The following varieties fruited for the first time, several of them are very fine summer and autumn apples, but as there are a great many superior summer apples, additional varieties would need to be of very superior merit to be worthy of a place on an already overcrowded list.

George Neilson.—Tree a strong upright grower. Fruit below medium size, roundish oblate; stalk long and slender; cavity medium depth; calyx small and closed basin narrow and shallow; skin greenish yellow, nearly covered with a dull purplish red and freely sprinkled with small yellow dots; flesh white, juicy, crisp, fine grained, mild, pleasantly acid. Season middle to last of July.

Margaret.—Tree a feeble grower; fruit small, oblong, conical; stalk short and slender; cavity of medium depth, corrugated; skin greenish yellow with small red streaks in two shades; flesh white, fine grained, moderately juicy, pleasantly acid Season last of July.

Stribling.—Tree a fair grower; fruit below medium size, oblate, roundish, tapering to the eye; stalk short and slender; cavity moderately wide and shallow; calyx

large, open; basin narrow and corrugated; skin clear, pale yellow, nearly covered with splashes and stripes of light and deep red; flesh white, tender, only moderately juicy, mildly acid with a pleasant flavour. Season early August.

Deyne.—Tree a vigorous grower; fruit above medium in size, oblong, conical, somewhat ribbed; stalk long; cavity deep and wide; calyx large, closed; basin narrow and deep, deeply corrugated; skin, yellow, freely striped and splashed with bright red; flesh white, tender, not juicy, mildly acid. Season early August.

Arch Duchess Sophie.—Tree a feeble grower; fruit small, oblate, conical; stalk, short; cavity wide and shallow; calyx of medium depth, closed; basin wide and shallow; skin yellow, freely striped with bright red; flesh yellowish, crisp, moderately juicy, pleasantly acid; fruit very liable to scab. Season August.

Sack and Sugar—Tree a strong grower fruit small, roundish, tapering to the eye; stalk short and slender; cavity wide and of medium depth; calyx large and open; basin wide and of medium depth; skin pale yellow with an orange blush in the sun; flesh white, fine grained, soft, nearly sweet, of pleasant flavour. Season middle of August.

Dantzic Calville.—Tree a poor feeble grower; fruit below medium size, conical, slightly ribbed; stalk long and slender; cavity deep and wide; calyx small and closed; basin wide and of medium depth; skin pale yellow; flesh white, fine grained, soft, not juicy, nearly sweet. Season August.

Swintovka.—Tree a strong grower; fruit of medium size, oblate, conical; stalk long and slender; cavity narrow and deep; calyx small, sometimes open; basin narrow, deep and ribbed; skin yellow, nearly overspread with red and a whitish bloom; flesh white, firm, crisp, moderately juicy, slightly acid with a fine pleasant flavour. Season August.

Sops of Wine.—Tree a poor straggling grower; fruit medium size, oblong, conical; stalk short; cavity deep and wide; calyx small and closed; basin narrow and deep; skin yellow, nearly covered with deep red and a few grey dots; flesh yellowish white, not juicy, mild and pleasantly acid, with a pleasant flavour. Season August.

Stirling Castle.—Tree a moderate grower; fruit large, roundish, oblate; stalk short and stout; cavity wide and deep; calyx large and closed; basin wide and deep; skin greenish yellow with a bright orange cheek in the sun, and a few small reddish dots; flesh white, firm, moderately juicy and pleasantly acid. Season August.

Brockville Beauty.—Tree a strong and upright grower; fruit below medium size, conical; stalk of medium length, slender; cavity wide, round and deep; calyx large and open; basin of medium depth and narrow, corrugated; skin yellow, almost covered with bright red; flesh yellowish white, crisp, juicy, sprightly, pleasantly acid. Season August.

Cousinot de Bradenburg.—Tree a moderate grower; fruit above medium size, roundish, tapering to the eye and stalk; stalk short and stout; cavity deep and of medium width; calyx large, closed; basin deep and moderately wide, corrugated; skin a rich clear yellow with a few narrow stripes of red on the sunny side; flesh, yellowish, crisp, moderately juicy, a pleasant subacid. Season August.

Van Deman.—Tree a strong free grower; fruit medium to large, oblate conical; stalk short; cavity broad and shallow; calyx small; basin wide of medium depth and corrugated; skin yellow, freely striped and splashed with bright red; flesh white often stained near the skin, crisp, a little coarse, moderately juicy, sprightly acid with a pleasant flavour. Season August.

Rudolph.—Tree a vigorous grower; fruit large, conical ribbed; stalk short; cavity wide and shallow; calyx moderately large and closed; basin deep and narrow and deeply corrugated; skin yellow, with sometimes a faint blush; flesh whitish, coarse, fairly juicy and mildly acid. Season August.

August.—Tree a very moderate grower; fruit of medium size, oblong, conical; stalk short; cavity deep and narrow; calyx small, sometimes open; basin narrow,

deep and corrugated; skin clear, yellow, freely striped and splashed with red in two shades, and with a thin whitish bloom; flesh white, moderately juicy, crisp, sprightly; very apt to be deformed and scabby. Season August.

Gold Medal.—Tree a fair grower; fruit above medium size, roundish oblate; stalk short; cavity narrow and shallow; calyx small and closed; basin wide and shallow, deeply ribbed from stalk to calyx; skin yellow with greenish dots; flesh yellowish, juicy, sprightly, pleasantly acid. Season August.

Wisconsin Spy.—Tree a free grower; fruit very large oblong, conical; stalk of medium length; cavity narrow and deep; calyx small and closed; basin narrow and deep; skin yellow, nearly covered with bright red in two shades; flesh yellowish, juicy, crisp, very pleasantly acid. Season August.

Irish Peach.—Tree a moderate grower; fruit small, roundish, conical; stalk short and slender; cavity small and shallow; calyx small and open; basin narrow, shallow and corrugated; skin yellow, nearly overspread with dull red, and a few gray dots; flesh yellowish, crisp, tender, juicy, with a pleasant flavour, nearly sweet. Season August.

Shorlock Reinette.—Tree a free and upright grower; fruit of medium size, conical; stalk short and slender; cavity narrow and deep; calyx small, closed; basin deep and wide, corrugated; skin pale yellow, splashed and streaked over nearly the whole surface with two shades of red; flesh greenish white, crisp, fairly juicy and pleasantly acid. Season August.

Broad Cheek.—Tree a strong and spreading grower; fruit of medium size, oblong, conical; stalk long and slender; cavity narrow and shallow, ribbed; calyx fairly deep and partly open; basin narrow, shallow and corrugated; skin yellow, freely streaked with red in two shades; flesh whitish, sometimes stained next the skin, crisp, juicy, sprightly with a pleasant flavour. Season August.

Crimson Queening.—Tree a strong grower; fruit of medium size, conical; stalk of medium length; cavity narrow and deep; calyx large, sometimes open; basin small; skin yellow, nearly covered with crimson; flesh whitish, crisp, breaking, fine grained, moderately juicy, pleasantly acid with a fine flavour. Season last of August and September.

Lead of St. Petersburg.—Tree a moderate grower; fruit of medium size, oblate, tapering a little to the eye; stalk short; cavity of medium depth and narrow; calyx small, closed; basin narrow and shallow; skin yellow, nearly covered with a pink blush; flesh white, not juicy, mildly acid. Season August.

Revel Glass.—Tree a moderate grower; fruit of medium size, oblate conical; stalk short; cavity of medium size; calyx small and open; basin medium width, deep and corrugated; skin yellow with a reddish blush and a little russet about the stalk; flesh white, crisp, juicy, mild and pleasantly subacid. Season August.

Possart.—Tree a free grower; fruit of medium size, roundish, oblate, tapering to the eye; stalk short; cavity deep, wide and ribbed; calyx large, partly open; basin deep, narrow and deeply corrugated; skin greenish yellow with small streaks and patches of dull red; flesh greenish white, moderately juicy but corky and mildly acid. Season August.

Lady Sudely.—Tree a moderate grower; fruit above medium size to large, conical; stalk short; cavity narrow and shallow; calyx large, open; basin deep, narrow and corrugated; skin clear yellow, striped with bright red on sunny side; flesh yellowish, crisp, fairly juicy, fine grained and pleasantly acid, with a fine flavour. Season late August.

Yellow Anis.—Tree a moderate grower; fruit below medium size, roundish oblate; stalk short; cavity small; calyx small, closed; basin narrow and shallow, deeply corru-

gated; skin yellow, freely splashed and streaked with light and dark red; flesh white, fine grained, juicy, mild and pleasantly acid. Season August.

Cheshunt Pippin.—Tree a moderate grower; fruit below medium size, globular; stalk short; cavity narrow; calyx small and open; basin deep and wide; skin yellow, freely striped and splashed with red and a few gray dots; flesh yellowish, firm, moderately juicy, fine grained, pleasantly acid, with a fine flavour; fruit drops badly. Season August.

Maltster.—Tree a free grower; fruit above medium size, globular, irregular ribbed, slightly tapering to the eye; stalk of medium length; cavity, deep and wide; calyx of medium size, closed; basin large and corrugated; skin yellow with red stripes on the sunny side; flesh yellowish, mildly acid, watercores. Season August.

Minister.—Tree a fair grower; fruit below medium size, globular, a little conical; stalk of medium length; cavity deep and wide; calyx of moderate depth, closed; basin narrow and deep, corrugated; skin pale yellow with a few red stripes; flesh yellowish white, moderately juicy, mildly acid, rather corky, not valuable; Season August.

Okera.—Tree a fair grower; fruit medium size, oblong, conical; stalk short; cavity narrow and deep; calyx small, closed; basin rather large; skin yellow, nearly covered with pale dull red; flesh white, crisp, juicy, mild and pleasantly acid. Season August.

Yorkshire Beauty.—Tree a strong grower; fruit large, conical; stalk long; cavity deep and wide; calyx large and open; basin moderately wide and shallow; skin rich yellow with a light red cheek; flesh whitish, firm, crisp, moderately juicy with a sprightly pleasant flavour, very handsome and fairly good. Season, August.

Buda.—Tree a strong and spreading grower; fruit large, conical, ribbed and irregular in growth; stalk of medium length; cavity deep and irregularly corrugated; calyx of medium size, closed; basin deep, narrow and corrugated; skin yellow with a bright red blush; flesh, yellowish, juicy, tender, mild, pleasantly acid. season late August and September.

Sir Oliver.—Tree a fair grower; fruit of medium size, oblate, depressed; stalk short; cavity large; calyx of medium depth, closed; basin wide and deep; skin yellow, splashed and streaked with two shades of red on the sunny side; flesh yellowish, crisp, firm, fine grained, juicy, mildly acid, with a very pleasant flavour. Season August and September.

Saxton.—Tree a strong grower; fruit below medium size, roundish, oblate; stalk short; cavity broad and shallow; calyx large, partly open; basin wide, shallow and corrugated; skin greenish yellow, striped and splashed with light and dark red; flesh tender, juicy, subacid, with a very pleasant aromatic flavour. Season September.

Hardisty.—Tree a strong grower; fruit above medium size, roundish, conical; stalk short; cavity narrow and moderately deep; calyx large, partly open; basin shallow and flat, corrugated; skin whitish nearly overspread with bright red and a few gray dots; flesh, white, crisp, juicy, sometimes stained with red next the core, with a pleasant quince flavour, mildly acid. Season last of August and September.

Legal Tender.—Tree a fair grower; fruit of medium size, conical; stalk short; cavity wide and shallow; calyx small and closed; basin narrow and moderately deep; skin yellow, nearly overspread with dull red and many yellowish dots; flesh yellowish, crisp, fine grained, subacid with a pleasant flavour. Season September and October.

Andrew's Sweet.—Tree a moderate grower; fruit of medium size, conical; stalk short; cavity small; calyx small; basin deep and narrow, corrugated; skin clear yellow; flesh white, firm, crisp, juicy, sweet; quality very good. Season September.

Smith's No. 2.—Tree a fair grower; fruit below medium size, oblate; stalk of medium length; cavity wide and deep; calyx small, closed; basin large and corrugated; skin greenish yellow splashed with dull red; flesh whitish, fine grained, crisp, with a pleasant flavour, slightly acid; quality good but too small. Season September.

Mitchell.—Tree a feeble grower; fruit below medium size, roundish, oblate; stalk long; cavity deep and wide; calyx small, closed; basin wide and deep; skin yellow striped with clear red on sunny side; flesh white, crisp, juicy, subacid with a pleasant flavour. Season September.

New Hawthornden.—Tree a strong grower; fruit above medium size, oblate, tapering to eye; stalk of medium length; cavity wide and flat; calyx small and open; skin yellow, mottled with greenish spots and specks; flesh white and moderately juicy, slightly corky, mildly acid. Season September.

White Russet.—Tree a strong grower; fruit below medium size, oblate, ribbed; stalk short; cavity narrow and deep; calyx small and open; basin of medium size, corrugated; skin yellow freely streaked with two shades of red; flesh white, firm, juicy, sprightly; fruit drops badly. Season September.

Jaune de Treves.—Tree a moderate grower; fruit small, oblate, conical; stalk long and slender; cavity narrow and deep; calyx small and open; basin small, corrugated; skin pale yellow; flesh white, fairly juicy, sprightly, acid with a bitter after taste; not valuable. Season October.

Mere de Menage.—Tree a moderate grower; fruit large, oblate, tapering a little to the eye; stalk short and stout; cavity wide and deep; calyx large and open; basin large; skin whitish yellow, streaked and splashed with red in two shades; flesh white, juicy, firm, pleasantly acid, a fine cooking apple. Season October.

Bartholemy Dumortier.—Tree a fair grower; fruit above medium size, globular, conical; stalk of medium length, slender; cavity deep and wide; calyx medium to large and open; basin narrow and deep; skin a rosy yellow with many short narrow stripes of light red; flesh white, crisp, moderately juicy, almost sweet, with a pleasant flavour. Season October and November.

Teinte Fraise.—Tree a slow grower; fruit of medium size, conical; stalk short; cavity wide and deep; calyx large and sometimes open; basin narrow, deep and corrugated; skin yellow, nearly covered with stripes and splashes of bright red; flesh yellow stained next the skin, rather dry, granular, mildly acid; not valuable. Season October.

Hollanbury.—Tree a fairly vigorous grower; fruit large, oblate, somewhat ribbed; stalk short; cavity deep and wide; calyx large, closed; basin wide and deep, sometimes deeply corrugated; skin greenish yellow with a dull pale red blush on sunny side, and a few gray dots; flesh white, coarse, soft, pleasantly acid. Season October and November.

Late Winter.—Tree a moderate grower; fruit a little above medium size, globular; stalk short; cavity deep and narrow; calyx large, partly open; basin wide and deep, corrugated; skin yellow with a red cheek; flesh yellowish sprightly, fine grained with a pleasant flavour; quality good. Season October and November.

Prince Edward.—Tree a fair grower; fruit of medium size, oblong, conical; stalk short; cavity deep and wide; calyx small and open; basin deep and narrow; skin yellowish white, splashed and streaked with two shades of red; flesh white, juicy, sprightly, fine grained, somewhat astringent. Season October.

Duchess Favourite.—Tree a vigorous grower; fruit small, roundish, conical; stalk long and slender; cavity fairly deep and wide; calyx large, open; basin small; skin clear yellow, handsomely splashed and streaked with red and many reddish dots; flesh yellowish, stained at the core with red, crisp, juicy, with a pleasant flavour, mildly acid. Season October.

High Canons.—Tree a feeble grower; fruit very small, oblate, conical; stalk long and slender; cavity large and funnel-shaped; calyx large, closed; no basin; skin clear yellow with a bright red blush and streaks of red; flesh white, fine grained, juicy, mildly acid with a very pleasant flavour; a handsome apple of good quality, but too small to be of value. Season October and November.

Tibbets Pearmain.—Tree a feeble grower; fruit above medium size, conical; stalk of medium length and slender; cavity round, deep and smooth; calyx small and open; basin small and shallow; skin yellow, striped with dull red on the sunny side; flesh yellowish, crisp, moderately juicy, mildly acid. Season October and November.

Scinde Center.—Tree a strong upright grower; fruit large, oblong, conical; stalk short; cavity narrow and deep; calyx small, partly open; basin deep and wide; skin yellow, freely striped and splashed with bright red; flesh yellowish, crisp, mildly acid. Season October.

Longueuil.—Tree a fair grower; fruit small, roundish, conical; stalk short; cavity narrow and wide; calyx small, closed; basin shallow and narrow, corrugated; skin yellowish green, freely splashed and striped with red in two shades; flesh white, juicy, tender, crisp, mildly acid, with a very pleasant flavour; too small to be of value. Season October and November.

Hardisty X.—Tree a fairly vigorous grower; fruit of medium size, roundish, oblate; stalk long and slender; cavity very small; calyx small, closed; basin narrow and wide; skin greenish yellow with small dashes of dark red on the sunny side; flesh white, stained with red, juicy, crisp, with a fine flavour; nearly sweet. Season October to December.

Dance de Rockfort.—Tree a medium grower; fruit large, irregularly oblate, sometimes conical, ribbed; stalk short; cavity deep and wide, often russetted; calyx large, open; basin wide and deep, and deeply corrugated; skin greenish yellow, with an orange blush in the sun; flesh white, crisp, breaking, moderately juicy, very sweet. Season October and November.

Calville Garibaldi.—Tree a strong free grower; fruit large, oblate, conical, ribbed; stalk short; cavity narrow and deep; calyx large, sometimes open; basin narrow, shallow and deeply corrugated; skin clear yellow, with a faint blush on the sunny side; flesh white, juicy, breaking, a little coarse grained, pleasantly subacid; good Season October and November.

Gros Vert.—Tree a fair grower; fruit of medium size, globular, conical; stalk long and slender; cavity medium to large; calyx medium, closed; basin deep and narrow; skin yellowish, with a dull red cheek, a little russet about stalk and many gray dots; flesh white, juicy, a little coarse, mildly subacid. Season November and December.

Calville de Femmes.—Tree a slow grower; fruit large, slightly conical, oblate; stalk short, cavity moderately deep and narrow; calyx large, closed; basin deep, moderately wide and corrugated; skin greenish yellow with a dull red cheek and a few whitish dots; flesh white, juicy, rather coarse, breaking, nearly sweet. Season November and December.

Rose de Benange.—Tree a moderate grower; fruit below medium size, conical; stalk short; cavity large, round; calyx large, closed; basin small and wrinkled; skin clear yellow with a red cheek on sunny side and a few small whitish dots; flesh white rather dry, fine grained, sweet. Season November and December.

Dame de Fauquemont.—Tree a fair grower; fruit large, oblate, tapering a little to the eye; stalk short; cavity wide and deep; calyx large, sometimes open; basin moderately wide and deep; skin yellowish with a brownish red cheek; flesh whitish, coarse, granular, fairly juicy, subacid. Season November.

Arneth.—Tree a fair grower; fruit below medium size, broadest at calyx; stalk short; cavity narrow and shallow; calyx large, open; basin wide and deep; skin yellow with many gray dots and russet about the stalk; flesh yellowish, crisp, fine grained, medium, pleasantly acid. Season November and December.

Reinette Simirenko.—Tree a strong grower; fruit medium to large, globular, slightly conical; stalk short; cavity wide and deep; calyx small, closed; basin small and corrugated; skin greenish yellow with a few white dots and a thin whitish bloom;

flesh white, coarse, fairly juicy, mildly subacid with a pleasant flavour. Season December.

Wilford Park Nonsuch.—Tree a strong grower; fruit below medium size, oblate, conical; stalk long, slender; cavity wide and deep; calyx large, open; basin wide and flat; skin yellow russeted; flesh white, rather dry, mildly subacid very nearly sweet. Season December.

Rose of Sharon.—Tree a poor grower; fruit medium or below; oblate, conical; stalk short; cavity narrow, deep and irregular; calyx large and open; basin deep and wide; skin dull yellow with a few gray dots; flesh white, not juicy, fine grained with a peculiar flavour, mildly subacid. Season October and November; not desirable.

Thomas Rivers.—Tree a feeble grower; fruit large, oblong, tapering to stalk and calyx; stalk of medium length; cavity moderately deep and spreading; calyx of medium size, sometimes open; basin narrow, deep and corrugated; skin greenish yellow with a reddish blush on the sunny cheek and many whitish dots; flesh yellowish white, juicy, crisp, fine grained, pleasantly subacid. Season October and November.

Sandringham.—Tree a strong and spreading grower; fruit above medium size, conical; stalk short; cavity moderately deep and wide; calyx large and open; basin narrow, deep and corrugated; skin greenish yellow with a dull red cheek and a little russet about the stalk; flesh white, fine grained, juicy, mildly subacid with a pleasant flavour. Season November and December.

Berry.—Tree a free grower. Fruit of medium size, roundish conical; stalk of medium length, slender; cavity fairly deep and wide; calyx of medium size, open; basin small, corrugated; skin dull greenish yellow, streaked and blotched with bright and dark red and many gray dots; flesh yellowish, firm, fine grained, fairly juicy, pleasantly acid. Season December and January.

Arctic.—Tree a strong grower; fruit of medium size, oblong, slightly conical; stalk slender; cavity shallow and small; calyx of medium size and closed; basin narrow, moderately deep; skin yellow, freely striped and splashed with deep red; flesh white, firm, fine grained, juicy, mild and pleasantly acid. Season December and January.

Grafinst Red.—Tree a medium grower; fruit of medium size, roundish, oblate; stalk short; cavity narrow and shallow; calyx large, partly open; basin deep and wide, and deeply corrugated; skin yellow, nearly covered with light red; flesh whitish, fairly juicy, firm, mildly acid. Season December.

Winter Peach.—Tree a strong grower; fruit of medium size or above, oblate, conical; stalk long; cavity wide and deep; calyx small and partly open; basin narrow and deeply corrugated; skin whitish yellow with sometimes a dull red blush; flesh yellowish white, juicy, crisp, tender, mildly subacid; quality good. Season December to February.

Bedfordshire Foundling.—Tree a poor grower; fruit about medium size, roundish conical; stalk long and slender; cavity round, moderately deep and wide; calyx large, open; basin narrow and deep; skin greenish white with sometimes a brownish red blush and scattering gray dots; flesh whitish, tender, juicy and pleasant, mildly acid. Season November and December.

Lady Henniker.—Tree a fair grower; fruit above medium size, roundish, oblate; stalk short; cavity deep and narrow; calyx large, open; basin wide and deep; skin dull yellow with a small light red blush and a little russet about the cavity; flesh white, coarse, moderately juicy and pleasantly acid. Season December.

Norfolk Bearer.—Tree a fair grower; fruit above medium size, conical; stalk short; cavity wide and deep; calyx large and open; basin small; skin dull russet green with dull red, covering more than half the surface; flesh greenish white, firm, moderately juicy, mildly acid. Season January to March.

Reinette Sanguine.—Tree a strong grower; fruit of medium size, oblate, conical; stalk long and slender; cavity round, smooth and deep; calyx small and open; basin

wide and deep; skin greenish yellow, freely splashed and striped with light red and sprinkled with whitish dots; flesh white, crisp, juicy, mildly acid, with a pleasant flavour. Season December to March.

Double Bon Pommier.—Tree a strong grower; fruit medium to large, ribbed, conical; stalk short; cavity wide and fairly deep; calyx small and sometimes open; basin moderately wide and deep; skin greenish yellow, nearly overspread with dark red and sprinkled with whitish dots; flesh yellowish, fine grained, juicy, very pleasant, subacid. Season January and March.

The question is frequently asked by intending planters: What varieties shall I plant? In a country of such varied climatic and soil conditions as British Columbia a list has to be made to suit as nearly as possible the district where the orchard is to be planted, and in the large number of apples tested at this experimental farm good varieties may be named to suit almost any district where apple trees can be grown. In the following short list varieties to suit almost any district may be found, and all are very good varieties and good either for home use or for a commercial orchard:—

Duchess of Oldenburg	Summer.
Gravenstein	"
Wealthy	Autumn.
King of Tompkins County	Fall.
Cox Orange Pippin	"
McIntosh Red	Early Winter.
Grimes Golden	"
Jonathan	"
Wagener	"
Northern Spy	Winter.

PEARS.

The pear crop was only a very moderate one this year, but the quality was superior. Quite a number of untried varieties fruited and a short description of each one is appended. Some of them are of fine size and appearance with very superior quality, and if the trees prove vigorous growers and productive, they will soon make a place on the lists of varieties wanted by planters in this province.

Matilda.—Tree a strong grower; fruit small, obovate, acute pyriform; stalk one and a quarter inch long; calyx large, open; basin wide, shallow and flat; skin clear yellow, with many small gray dots; flesh yellowish white, firm, not very juicy, sweet and fine grained; a large core and at the core quite gritty. Season August; not specially valuable.

Peche.—Tree a moderate grower; fruit below medium size, obovate, obtuse pyriform; stalk one inch long, slender, set without cavity and often by a lip; calyx small, sometimes closed; basin quite small; skin smooth yellowish green, with a patch of russet about the stalk and many gray dots; flesh white, fine grained, almost buttery, sweet, slightly astringent. Season last of August.

Caillot Rosat.—Tree a fine grower; fruit of medium size, handsome, oblong, ovate, pyriform; stalk one and a half inches long, sometimes set by a lip; calyx small and open; basin very small; skin orange yellow, with russet about stalk and many gray dots; flesh yellowish white, crisp, moderately juicy, mingled sweet and acid; only for cooking. Season August.

Marguerite Marilat.—Tree a free grower; fruit very large, obtuse, pyriform; stalk half an inch long, stout, and set by a knob; calyx small and open; basin small; skin yellow, with a fine red cheek in the sun, and many gray dots; flesh white, juicy, buttery, sweet, very good. Season last of August.

Fondante de Cuerne.—Tree a strong grower; fruit of medium size or below medium, obovate, obtuse, pyriform; stalk one inch long; cavity small and shallow; calyx small and open; basin small; skin greenish yellow, with a little russet about the stalk and calyx, and russet-red cheek; flesh white, juicy, buttery, sweet, and of fine quality. Season August.

Delpierre.—Tree a moderately vigorous growber; fruit above medium, obtuse, pyriform; stalk long, set obliquely or to one side; cavity very small; calyx small, partly open; basin small and smooth; skin yellowish, blotched with russet and sprinkled with brown dots. Flesh whitish yellow, juicy, sweet, slightly vinous, very good. Season September.

Leonie Bouvier.—Tree a fair grower; fruit medium or below, obovate, acute, pyriform; stalk long, set inclined; calyx fairly open; basin wide and moderately deep; skin greenish yellow, with a faint blush, a little russet about the stalk, and freely sprinkled with gray dots; flesh white, rather coarse, moderately juicy, sweet. Season last of September.

Le Brun.—Tree a feeble grower; fruit of medium size, oblong, pyriform; stalk long, set in a narrow cavity with a lip; calyx small; closed basin, shallow and smooth; skin yellowish green, with many gray dots; flesh white, juicy, melting, sweet, perfumed, quality good. Season September.

Beurre Montica.—Tree a strong grower; fruit below medium size, oblong, ovate, pyriform; stalk of medium length, curved; calyx small, open; basin shallow and narrow; skin smooth, greenish, with a dull bronze cheek and mottled with darker green spots; flesh white, sweet, not juicy, fine grained, with a pleasant flavour. Season late September.

Conference (Rivers).—Tree a vigorous grower; fruit large, oblong, pyriform; stalk about one inch long, curved and no cavity; calyx large, open basin, shallow; skin dull yellow, with patches of russet near the eye; flesh white, juicy, buttery, very sweet, with a fine flavour. Season last of September and early October.

Vermont Beauty.—Tree a fair grower; fruit below medium size, obovate, obtuse, pyriform; stalk of medium length, slender; calyx medium and open; basin medium; skin yellow, with an orange blush in the sun, and a few small patches of russet; flesh white, not very juicy, slightly astringent, sweet with a pleasant flavour. Season October.

Peffer's No. 2.—Tree a strong grower; fruit of medium size, roundish, obovate, pyriform; stalk of medium length, set sometimes by a small lip; calyx of medium depth; basin small; flesh white, juicy, firm, not sweet, but vinous, pleasant, gritty at the core. Season October. Not specially valuable.

Première de Marie Lesueur.—Tree a medium grower; fruit above medium size, obovate, acute, pyriform; stalk of medium length; cavity very small; calyx small and open; basin narrow and moderately deep; skin greenish yellow, with a few small russet patches, and with russet about the stalk and a few gray dots; flesh white, juicy, buttery, sweet, with a fine flavour; very good. Season October.

Duchesse Elsa.—Tree a vigorous grower; fruit of medium size, obovate, obtuse, pyriform; stalk long, slender; cavity small; calyx small and open; basin of medium depth; skin greenish yellow, with many brown dots and russet brown in the sun; flesh fine grained, juicy, very sweet, and fine flavoured. Early October; very good.

Belle Rouanaise.—Tree a free grower; fruit below medium size, obovate, acute, pyriform; stalk three-quarters of an inch long and stout, set obliquely and sometimes by a lip; calyx large and open; basin wide and shallow; skin yellow with many russet dots; flesh white, moderately juicy, tender, sweet, slightly aromatic, very pleasant, but fruit cracks badly. Season October.

Anversoise.—Tree a medium grower; fruit below medium, obovate, acute, pyriform; stalk long, slender and set obliquely; calyx large, open; basin wide and deep; skin greenish yellow, with considerable russet; flesh whitish, juicy, fine grained,

almost buttery, very sweet, very fine flavour, but liable to crack. Season last of September and October.

Souvenir de la Salle.—Tree a vigorous grower; fruit small to medium, obovate, acute, pyriform; stalk long and slender, set obliquely by a lip; calyx large and open and basin shallow and small; skin yellowish green, with small patches of russet and many gray dots; flesh white, very juicy, sweet, fine grained, with a pleasant flavour, Season October and November; liable to crack.

Dr. Trousseau.—Tree a moderate grower; fruit below medium size, obovate, pyriform; stalk long; calyx large and open, basin wide and shallow; skin greenish yellow, with many small russet dots; flesh yellowish, juicy, melting, slightly astringent, vinous, with a pleasant flavour. Season October and November.

Louis Gregoire.—Tree a strong grower; fruit below medium in size; roundish, obovate, pyriform; stalk long; calyx medium and open, basin small; skin greenish yellow, springled with russet dots and patches of russet; flesh whitish, juicy, sweet, slightly astringent, vinous and pleasant; gritty at the core. Season October and November.

Souvenir de la Reine des Belges.—Tree a strong grower; fruit of medium size, acute, pyriform; stalk of medium length inserted in a ring; calyx small, open, basin small; skin pale yellow with a reddish brown cheek and patches of russet; flesh yellowish white, juicy, fine grained, melting sweet, perfumed; quality good. Season October and November.

Beurre Burnicq.—Tree a fair grower; fruit of medium size, obtuse, pyriform; stalk of medium length, set obliquely by a knob; calyx medium width, open, basin small and deep; skin greenish yellow with brownish russet spots; flesh white, juicy, fine grained, a little acid, with a pleasant vinous flavour. Season October and November.

Marie Zallais.—Tree a free grower; fruit of medium size, obovate, obtuse, pyriform; stalk of medium length; calyx large and open, no basin; skin yellow with many brown dots; flesh whitish, juicy, almost melting, sweet, with a pleasant but not high flavour; quality good. Season October to December; somewhat gritty at the core.

Louise Bonne de Printemps.—Tree a vigorous grower; fruit medium to large, oblong, ovate, pyriform; stalk short, set in a small cavity; calyx of medium width, open, basin small and shallow; skin yellow with many russet dots and a few small patches of russet about the stalk; flesh white, juicy, buttery, sweet, perfumed, gritty at the core. Season October and November.

Delices de Froyennes.—Tree a fair grower; fruit below medium size, roundish, acute, pyriform; stalk long and stout, set by a lip; calyx open; skin deep orange russet, with many russet dots; flesh white, juicy, buttery, sweet, perfumed. Season October and November.

Belle Juile.—Tree a strong grower; fruit below medium size, globular, obtuse, pyriform; stalk long, depression very small, sometimes a lip; calyx large, open; skin yellow, with patches of russet about the stalk, and many russet dots; flesh yellowish, juicy, buttery, sweet, slightly vinous; quality good. Season October and November.

Beurre Jean Van Geert.—Tree a strong grower; fruit medium to large, obovate, pyriform; stalk long and slender, often by a lip; calyx large, open, basin wide and flat; skin yellowish white, with a reddish blush; flesh white, fine grained, melting, juicy, sweet; good, but gritty at the core. Season October and November.

Comte de Lambertye.—Tree a small grower; fruit of medium size, oblate, obtuse, pyriform; stalk short, stout, and set by a lip in a shallow depression; calyx of medium width and partly closed, basin wide and deep and corrugated; skin yellowish green with small patches of russet about stalk and calyx, and a few russet dots; flesh whitish, juicy, buttery, good. Season October and November.

Pierre Corneille.—Tree a strong grower; fruit medium to large, acute, pyriform; stalk set without depression; calyx small and open, basin small and smooth; skin

smooth yellow with a reddish cheek and a few small gray dots; flesh yellowish, juicy, buttery, very sweet, perfumed, very good. Season last of October, November and December.

Alexandre Lambre.—Tree a fair grower; fruit small, obtuse, pyriform; stalk of medium length, cavity narrow and shallow; calyx large, open, basin wide and shallow; skin greenish yellow, with many russet dots, and a russet brown cheek; flesh yellowish white, juicy, sweet, slightly astringent. Season early November.

Madame Torfs.—Tree a medium grower; fruit below medium size, obovate, pyriform; stalk medium in length, no depression; calyx of medium width, open, basin very small; skin clear yellow, with many gray dots; flesh white, juicy, sweet, with a very pleasant flavour, perfumed. Season October and November.

Bergamot Porteau.—Tree a strong grower; fruit small, roundish, almost oblate; stalk of medium length, no depression; calyx large and open, basin wide and of medium depth; skin of fine russet yellow, with small patches and dots of darker russet; flesh white, firm, moderately juicy, fine grained, almost buttery, sweet and very agreeable. Season November and early December.

Beurre Spac.—Tree a slow grower; fruit above medium size, obovate, pyriform; stalk of medium length, curved, cavity small; calyx large, open, basin wide and medium in depth; skin smooth, greenish yellow, with russet, about stalk, and many russet dots; flesh yellowish white, juicy, melting, very sweet; quality very good. Season last of October and November.

Colmar Sirande.—Tree a fair grower; fruit small, obovate, acute pyriform; stalk long, curved, and set by a small lip; calyx large and open, basin small; skin yellow with a few small patches of russet and russet dots; flesh white, fine grained, moderately juicy, sweet. Season November.

Doctor Guere.—Tree a strong grower; fruit nearly medium in size, roundish, obovate, acute, pyriform; stalk long and slender; calyx large and open, no basin; skin greenish yellow, with many gray dots; flesh white, juicy, smooth, fine grained, sweet, with a pleasant flavour. Season November.

Beurre de Fevrier.—Tree a strong grower; fruit of medium size, oblong, ovate, pyriform; stalk short; calyx small and open, basin very small; skin greenish yellow; flesh white, fine grained, juicy, sweet, slightly aromatic. Season December.

Alexander Chomier.—Tree a feeble grower; fruit small, obovate, acute, pyriform; stalk long, cavity small, sometimes with a small lip; calyx small and open, cavity narrow and deep; skin yellow, with many small gray dots; flesh white, not juicy, sweet. Season December and January.

Swan's Egg.—Tree a vigorous grower; fruit small, roundish, obovate; stalk long; calyx large and open; basin absent; skin dull greenish yellow, with a few brown specks; flesh yellowish white; soft, moderately juicy, pleasant, sweet. Season November and December.

Alexander Lucas.—Tree a strong grower; fruit very large, obtuse, obovate, pyriform; stalk short and stout, set by a lip in a small cavity; calyx small, open, basin flat and shallow; skin smooth yellowish green, with a dull bronze cheek, and many brown dots; flesh whitish, very juicy, buttery, with a very pleasant aromatic vinous flavour; quality good. Season December.

Duc de Morny.—Tree a fair grower; fruit of medium size; obovate, pyriform; stalk of medium length; calyx small and open, basin small, uneven; skin greenish yellow, with a reddish cheek and many small brown dots; flesh white, not juicy or crisp, sweet. Season December and January.

Duchess Grousset.—Tree a moderate grower; fruit small, obovate, obtuse, pyriform; stalk long, cavity very small; calyx large and open, basin wide and shallow; skin greenish yellow, with a few gray dots; flesh white, a little coarse, not melting, juicy, sweet. Season January and February.

Verulam.—Tree a strong grower; fruit medium to large, obovate; stalk of medium length and slender, no cavity; calyx small and partly open, basin small; skin green with a reddish brown cheek and many gray dots; flesh coarse, crisp; a cooking pear. Season December and March.

President de La Bastie.—Tree a strong grower; fruit of medium size, obovate, pyriform, almost oval; stalk of medium length and curved, no cavity; calyx small, sometimes closed, basin small; skin ridged and irregular, greenish yellow, with many gray dots; flesh yellowish, juicy, fine grained, melting, sweet, and very good. Season January to March.

Fondante de Ledeberg.—Tree a strong grower; fruit of medium size or below medium, oblong, pyriform; stalk of medium length, slender, no cavity; calyx of medium width and open, basin of medium size; skin smooth, greenish yellow, with narrow streaks of pale red on sunny side and a few gray dots; flesh white, sprightly, rather tough, not of much value. Season January.

President Fortier.—Tree a feeble grower; fruit large, obovate, oval, pyriform; stalk of medium length, stout and fleshy at insertion; calyx large, partly open, basin small and shallow; skin smooth and greenish yellow, with many russet dots; flesh whitish, very juicy, very sweet and agreeably perfumed, very good. Season January and February.

Doyenne Madame Cornuan.—Tree a fair grower; fruit of medium size, obovate, pyriform; stalk of medium length, cavity very small; calyx small and open, basin shallow and wrinkled; skin greenish yellow, with a few small patches of russet, and many russet dots; flesh white, very juicy, sweet, buttery, with a very agreeable flavour, somewhat gritty at the core; quality very good. Season February and March.

L'Inconnue.—Tree a strong upright grower; fruit of medium size, oval, pyriform; stalk medium in length, curved, set in a slight depression, sometimes by a lip; calyx of medium size, open, basin shallow and not wide; skin yellow with patches of russet and many russet dots; flesh whitish, juicy, melting, very sweet, with a rich pleasant flavour. Season December to March.

CHERRIES.

The cherry trees came through the winter in good condition, and bloomed very freely, and the fruit set very well. The Heart and Bigarreau cherries were ruined by the frequent showers which fell during the ripening of these varieties. The Morello and Duke varieties do not suffer so much from splitting as the sweet cherries. are more reliable croppers, and are as a consequence more profitable.

PLUMS.

No new varieties of plums fruited this year, but the plum crop was a fairly heavy one, and as the weather during the maturing and ripening of the crop was clear, bright and dry, there was very little rot. The list of really good varieties as given last year is retained, with the addition of Coe's Violet, Boddaert's Reine Claude and Hungarian Musk Prune, and would read in the order of ripening as follows:—

Damas de Corre.—Tree vigorous and productive; fruit large; yellow with red; July.

Mallard.—Tree vigorous and a regular and free producer; fruit large, purple; early August.

Curlew.—Tree a medium grower; very productive; fruit large, blue; early August.

Blue Apricot.—Tree a vigorous grower and a regularly heavy cropper; fruit of medium size; bluish purple; early August.

Washington.—Tree a vigorous grower and a free producer; fruit large, yellow. of very fine flavour; early August.

Sultan.—Tree a medium grower and productive; fruit large, deep red, of very good quality; early August.

Kirke.—Tree a moderate grower and very productive; fruit medium in size, dark purple; August.

Duane's Purple.—Tree a vigorous grower and a free producer; fruit large, purple, very good; August.

Reine Claude d'Ecully.—Tree a strong open grower and a free bearer; fruit large, greenish yellow, and of very superior quality; late August.

Belgian Purple.—Tree a strong grower and a regular producer; fruit large purple, very good; August.

Diamond.—Tree a strong grower and a free producer; fruit large, dark purple of fair quality and a good shipper; August.

Monarch.—Tree a strong grower and a regular producer; fruit large, dark purple, of good quality, and a splendid shipper; September.

Coe's Golden Drop.—Tree a strong grower and a fair producer; fruit large, yellow, with red, of very fine flavour and a good shipper; September.

Italian Prune.—Tree a vigorous grower and very productive; fruit above medium in size, very sweet, and a very superior shipper; September.

Boddaert's Reine Claude.—Tree a strong open grower and productive; fruit large roundish, skin pale yellow, juicy, very good, and a good shipper; August and September.

Hungarian Musk Prune.—Tree a fine grower and a free producer; fruit of medium size, dark purple, with a heavy bloom, flesh greenish, very sweet, with a rich flavour; last of August and September.

Coe's Violet.—Tree a strong grower, and productive; fruit large, dark purple, sweet, and of good flavour; a good shipper; September.

Of course, there are a great number of good plums besides those in this list; but these all have so many desirable points that each one of them would, under favourable conditions, prove profitable from a commercial point of view.

COMMERCIAL ORCHARDS.

The apple trees planted in the commercial orchard in which there are twelve trees of each sort, have grown vigorously, and a few of them bloomed in the spring of 1908; but the only variety to fruit was one tree Wagener which produced four fine apples.

We have in this orchard the following list:—Aiken, Jonathan, King, Mother, Sutton Beauty, Salome, Ontario, Grimes' Golden, Wagener, Monmouth Pippin, Cox's Orange Pippin, Rhode Island Greening. A few other varieties will be added as they can be secured.

PEARS.

A beginning has been made in this orchard and the following varieties have been planted:—Bartlett, Dr. Jules Guyot, Emile de Heyst, Howell, Beurre Clairgeau, River's Princess, and other varieties are being progagated for this test.

PLUMS.

A few varieties of plums have been planted in a commercial orchard, and other varieties are being propagated and will be planted as soon as they are large enough. The following varieties have been planted: Washington, Niagara, Duane's Purple, Diamond, Rivers Early, Damson, Curlew, Prince's Red Gage, Reine Claude d'Eculy, all of which have made satisfactory growth.

SMALL FRUITS.

Last winter there was much more snow than usual, and a great deal of very high wind which caused the snow to drift and pack in the berry plots, breaking down the canes badly; so much so that there was only a small crop of any kind of berries, and what we had were somewhat later in ripening than in some previous years.

RED AND YELLOW RASPBERRIES.

There are seventy-five varieties of Red and Yellow Raspberries under test. The following have been the best for a number of years:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Phœnix...	June 25.	Vigorous...	Large........	Firm; good quality........	Productive.
Pauline............	" 29.	" ..	"	Firm; good quality. Continues long in bearing.	"
Duke of Brabant......	" 30.	" ..	"	Firm; good quality.........	"
Northumberland Fill Basket.	" 30.	" ..	Very large....	Firm; good quality. Continues long in bearing.	"
All Summer........	July 1.	" ..	Large medium	Firm; good quality. Continues long in bearing.	"
Lord Beaconsfield....	" 2.	" ..	" .	Firm; good quality.........	"
London...........	" 2.	" ..	" .	Firm; good quality.........	"
Sarah..............	" 4.	" ..	" .	Firm; sweet; very good quality.	"
Cuthbert...........	" 5.	" ..	Large........	Firm; good quality.........	"
R. B. Whyte........	" 5.	" ..	Large medium	" " "	"
French Vice-President.	" 5.	" ..	Very large....	" " "	"
Golden Queen.........	" 6	" ..	Large.......	" " "	"
Large Yellow.........	" 6.	" ..	"	" " "	"

Besides the above, we have the following varieties, all of which are with us lacking in some one or more desirable quality.

Battler's Giant, Paragon, Charles, Hornet, Carter's Prolific, Belle de Fontenay, Baumforth's Seedling, Muskingum, Turner, Franconia, Hudson River Antwerp, Thomson, White Antwerp, Columbia, Arnold's Hybrid, Red Herrenhauser, Sugar of Metz, Carleton, Empire, Sharpe, Muriel, Craig, Autumn, Surprise, Knevit's Giant, La Mercier, Guinea, Garnet, Mary, Percy, Fastolf, Marlboro, Clarke, Heebner, Norwich Wonder, King, Chili, Garfield, Shaffer's Colossal, Queen Victoria, Sir John, Cariboo Wild, Col. Wilder, Brickle's Orange, Goliah, Lizzie, Millar, Minnie, Beehive, Spineless Yellow, Yellow Antwerp, Malta, Barnet, Lady Anne, Nonpareil, Billard's Perpetual, Prince of Wales, Champion, Crimson Beauty and Hansel.

BLACK CAP RASPBERRIES.

Name.	Date of Ripening	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Nemaha	July 4.	Vigorous	Large	Good quality	Productive.
Palmer	" 6.	"	Large medium	"	"
Older	" 6.	"	"	"	"
Kansas	" 6.	"	"	"	"
Mammoth Cluster	" 6	"	Large	"	"
Gregg	" 8.	"	"	"	"
Progress	" 8.	"	Medium	"	"
Ada	" 8.	"	"	"	"
Conrath	" 10.	"	"	"	"
Hopkins	" 10.	"	"	"	"

Besides the above, the following varieties are under trial here, all of which are lacking in some one or more good quality. At the time of ripening, there was very dry weather, and as a consequence all the black cap raspberries were smaller and drier than in some previous years:—Carman, Smith's Prolific, Cromwell, Lovett, American, Yellow Cap, Jackson's May King, Early Ohio and Oregon Late.

BLACKBERRIES.

The blackberry bushes were even more broken down by the snowdrifts than the other berry bushes, and as a consequence the crop was very small, but the quality of fruit was good, as it is nearly every year.

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Early King	July 20	Vigorous	Large	Good quality	Productive.
Agawam	" 22	"	Large, medium	"	"
Eldorado	" 24	"	Very large	Very good quality	"
Stone's Hardy	" 24	"	Large	Good quality	"
Hansel	" 24	"	Large, medium	"	"
Early Cluster	" 24	"	"	"	"
Maxwell	" 24	"	Large	"	"
Erie	" 24	"	"	"	"
Taylor	" 24	"	Large, medium	"	"
Ohmer	" 25	"	"	"	"
Tecumseh	" 25	"	"	"	"
Snyder	" 27	"	"	"	"
Lawton	" 27	"	Large	"	"
Taylor's Prolific	" 28	"	Medium	"	"
Oregon Everbearing	Aug. 1 to Oct. 1	"	"	Fair quality when very ripe	Very "

Besides the above, the following are also under test. They have not proved to be as good as those in the above list.

Wilson's Early, Kittatinny, Wilson Jr., Early Harvest, Crystal White, Gainor, Thompson's Mammoth, Lovett's Best, Child's Tree, Dallas and Brunton.

RED AND WHITE CURRANTS.

There are 41 varieties of Red and White Currants under test. Of these, the following are the best here:—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Red Cherry	June 27	Vigorous	Large, medium	Very good quality	Productive.
London Red	" 27	"	"	" "	"
White Grape	" 28	"	Large	" "	"
Raby Castle	" 28	"	"	Good quality	"
La Conde	" 28	"	Large, medium	"	"
La Fertile	" 28	"	"	"	"
Prince Albert	" 29	"	"	"	"
Fay's New	" 29	"	Medium	"	"
White Cherry	" 29	"	"	"	"
La Turinese	" 29	"	"	"	"
Gondoin Red	" 30	"	Large, medium	"	"
Large White Brandenburg	" 30	"	Large	"	"
White Pearl	" 30	"	Medium	"	"
Victoria	" 30	"	"	"	"

Besides the above varieties, the following have been tested, but found less valuable:—

White Transparent, White Gondoin, Red Dutch, Knight's Early Red, Norh Star, New Red Dutch, White Dutch, Fay's Prolific, Moore's Ruby, Versailles, No. 51 (L.S.) Langstraubige, White Esperin, Rankin's Red, Large White Frauendorfer, Verrier's White, Chenonceau, de la Rochepoze, Ringens, Beauty of St. Giles, Champaigner, English Red, Rouge Admirable, Large Red, White Kaiser, White Imperial.

BLACK CURRANTS.

There are 44 varieties of black Currants under test; of these the following have been found the best here :—

Name.	Date of Ripening.	Growth of Plant.	Size of Fruit.	Quality.	Productiveness.
Dominion	July 5	Vigorous	Large, medium	Mild, good quality	Productive.
Middlesex	" 5	"	"	Mild, sweet, good quality	"
Merveille de la Gironde	" 5	"	"	Slightly acid, good quality.	"
Prince of Wales	" 8	"	Large	Sweet, very good quality	"
Boskoop Giant	" 8	"	Very large	" "	"
Black Naples	" 8	"	Large	Sweet, good quality	"
London	" 8	"	Medium	"	"
Lee's Prolific	" 8	"	Large, medium	Mild, good quality	"
Pearce	" 9	"	Medium	"	"
Victoria	" 9	"	Large	Sweet, good quality	"
Climax	" 9	"	Medium	Mild, good quality	"

Besides the above, the following varieties have been tested, but are not so good:— Lennox, Bang Up, Gewohnliche, Eclipse, Sterling, Kerry, Perry, Ruler, Madoc, Kentish Hero, Ambrafarbige, Charmer, Beaudry, Ontario, Eagle, Lanark, Baldwin, Wood, Louise, Stuart, Kentville, Success, Star, Champion, Ethel, Parker, Monarch, Bella, Norton, Oxford, Orton and Henry.

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METEOROLOGICAL RECORD.

Date of Highest Temperature.	Temperature.	Date of Lowest Temperature.	Temperature.	Rainfall.	Snowfall.	Sunshine.	
1907.				Inches.	Inches.	Hours.	Minutes.
April 30	73	April 28	31	7·40	....	192	42
May 30	85	May 2	34	2·30	....	207	12
June 25	87	June 5	38	4·36	....	133	..
July 31	97	July 10 and 14	43	1·08	....	227	..
August 1	96	August 8	40	6·40	....	144	42
September 8	86	September 12	37	3·30	....	131	48
October 4	71	October 12	34	1·24	....	149	18
November 22	69	November 27	31	8·42	....	41	..
December 6	51	December 19	28	4·20	1	31	36
1908.				38·70	1		
January 27	54	January 31	22	3·04	1	62	18
February 23	53	February 1	20	5·22	5	67	12
March 23	59	March 23	28	7·64	....	89	42
				54·60	8	1,477	30

I have the honour to be, sir,

Your obedient servant,

THOS. A. SHARPE,

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